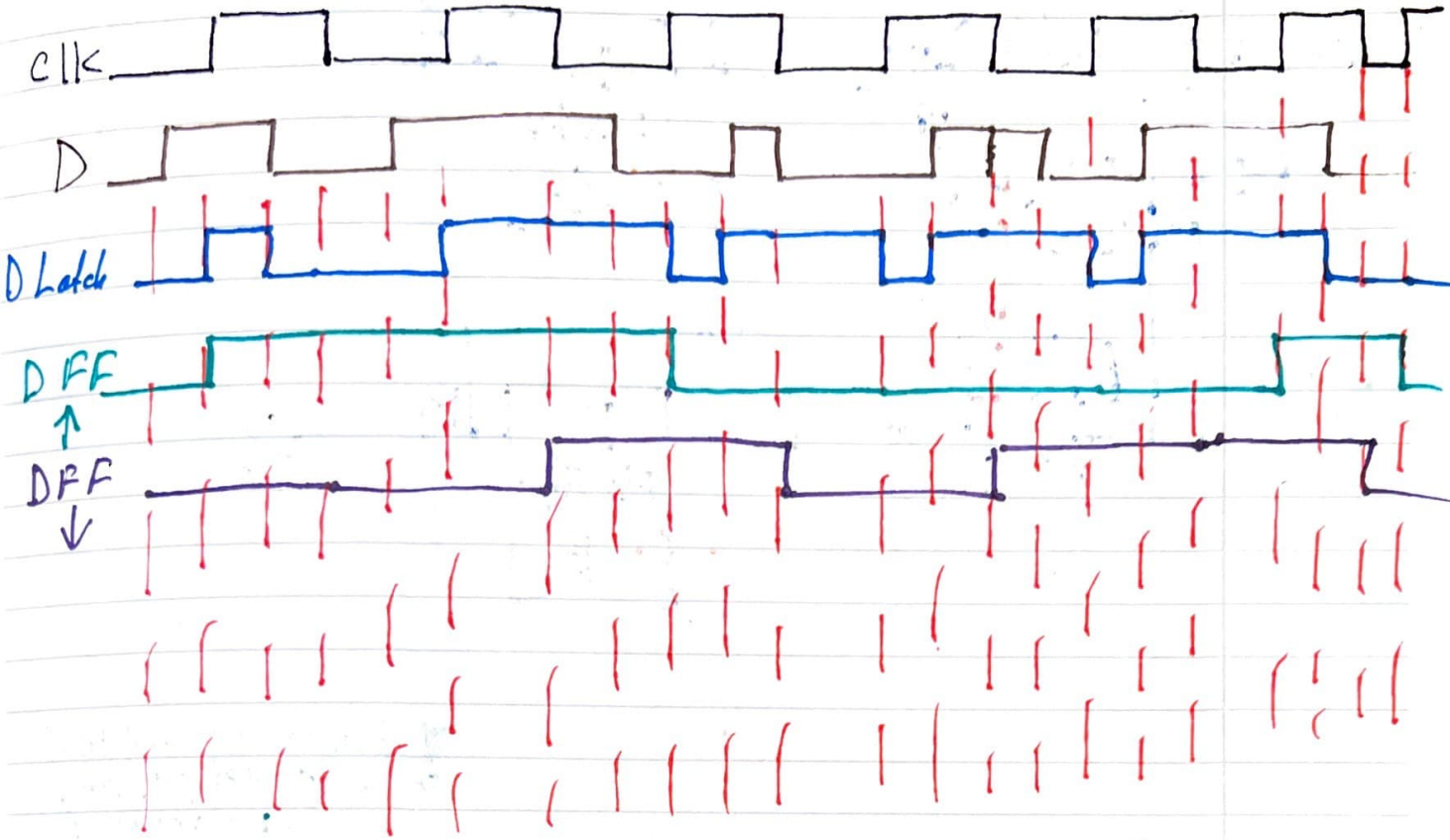
Homework 6

1) Waveforms for D Latch, DFF (↑), DFF (↓)



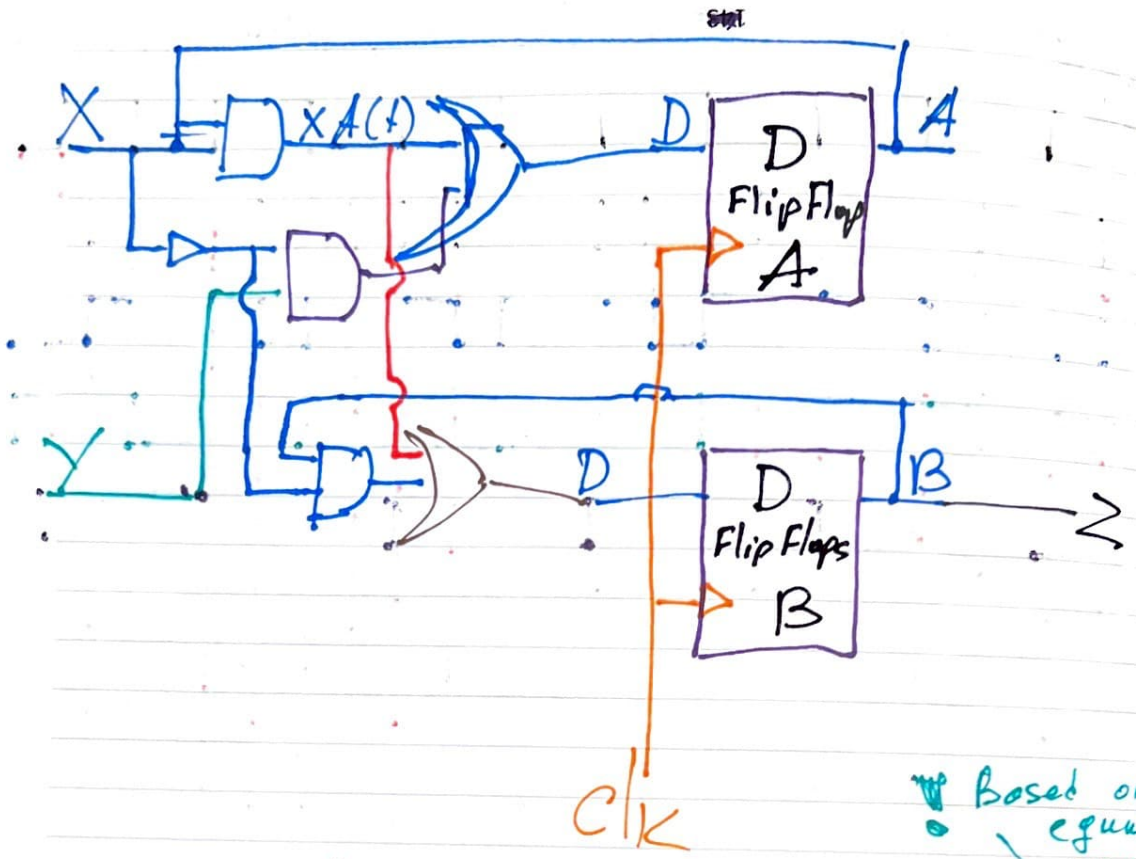
4. A sequential circuit with two D flip flops, A and B, two input x and y and one output z, is specified by the following next-state and output equations

$A(t+1) = x'y + xA$ (=0, =1, =1, =1)

$B(t+1) = x'B + xA$ (=0, =1, =1, =1)

$z = B$

a) Draw logic diagram of the ci



b) List the state table.

Because of present States and Inputs

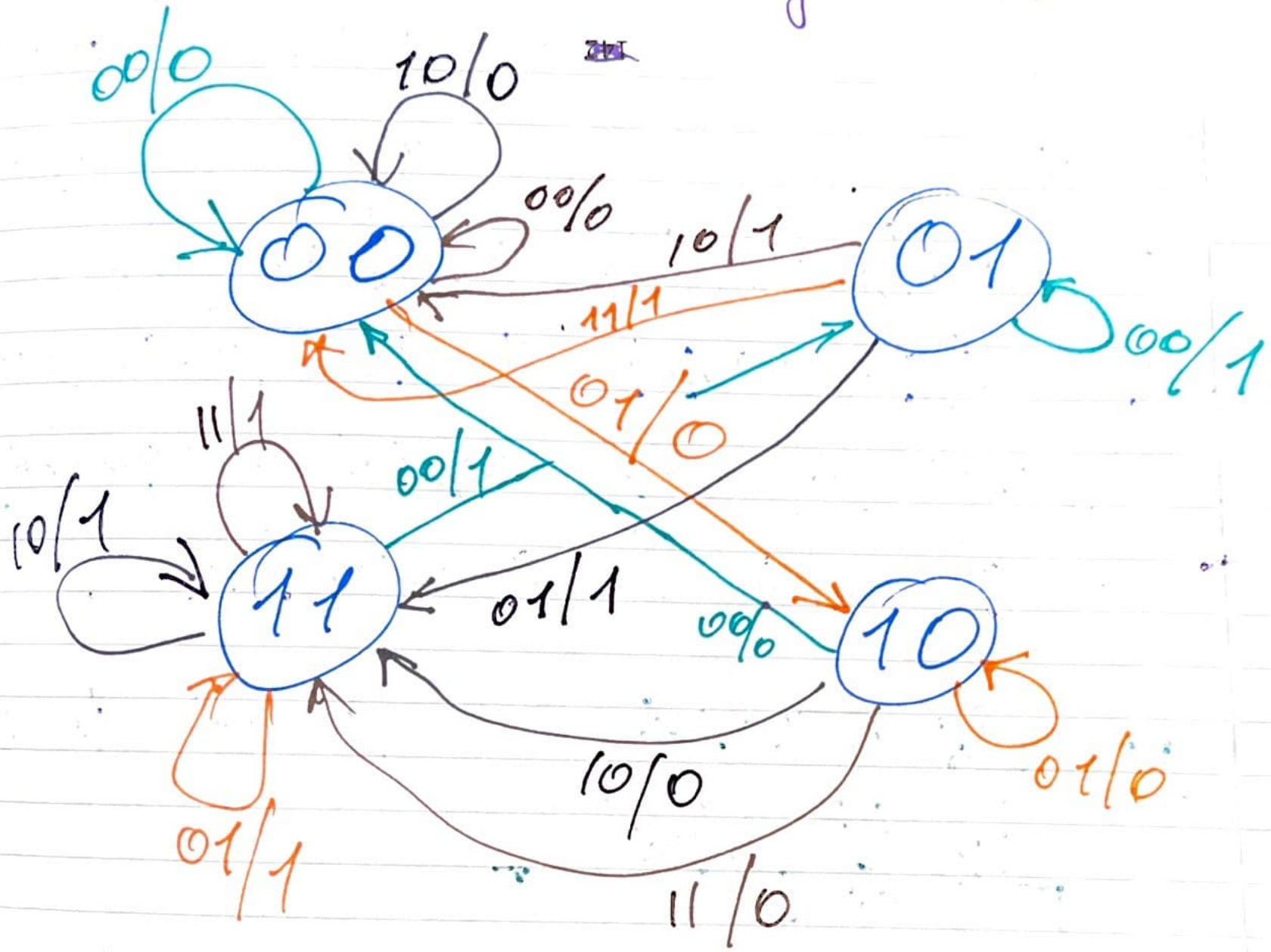
$A(t+1) = D$

Based on origi... equation, an... one term ... enough to ... in boolean ... it will ...

Present State		Inputs		Next State		Outp...
A(t)	B(t)	X	Y	A(t+1)	B(t+1)	Z
0	0	0	0	0	0	0
0	0	0	1	1	0	0
0	0	1	0	0	0	0
0	0	1	1	0	1	0
0	1	0	0	0	0	1
0	1	0	1	1	0	1
0	1	1	0	0	0	0
0	1	1	1	0	0	0
1	0	0	0	0	0	0
1	0	0	1	1	0	0
1	0	1	0	0	0	0
1	0	1	1	0	1	0
1	1	0	0	0	0	1
1	1	0	1	1	0	1
1	1	1	0	0	0	0
1	1	1	1	0	0	0

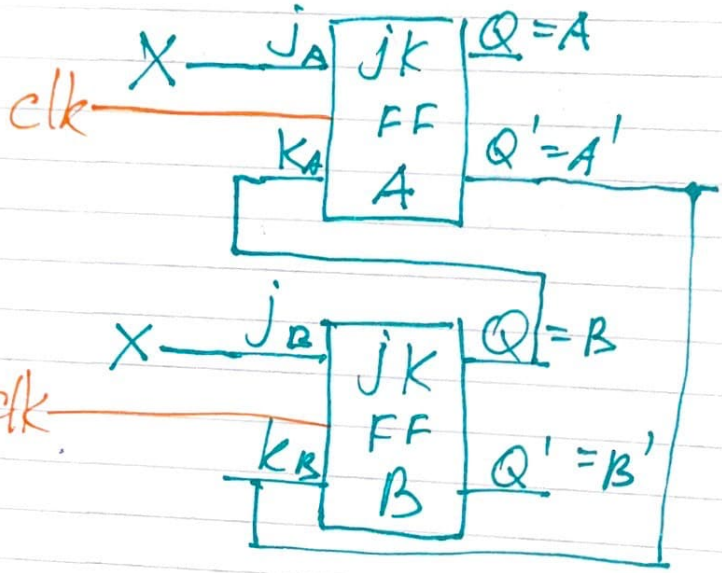
1 state
2 state
3 state
4 state

c) State diagram.



5. Sequential circuit has two JK FF A and B and one input x. The circuit is described by the following FF input equation: $J_A = x$, $K_A = B$, $J_B = x$, $K_B = A'$

a) Derive state equation $A(t+1)$ and $B(t+1)$ by substituting the input equations for the J and K variables.



$A(t+1) = J_A = x$

$B(t+1) = J_B = x$

Characteristic of JK FF $Q(t+1) = JQ' + K'Q$

now we have to substitute that expression

$Q_A(t+1) = J_A Q' + K_A' Q = J_A \cdot A' + K_A' \cdot A = x \cdot A' + B'A$

↑ expression for A JK FF

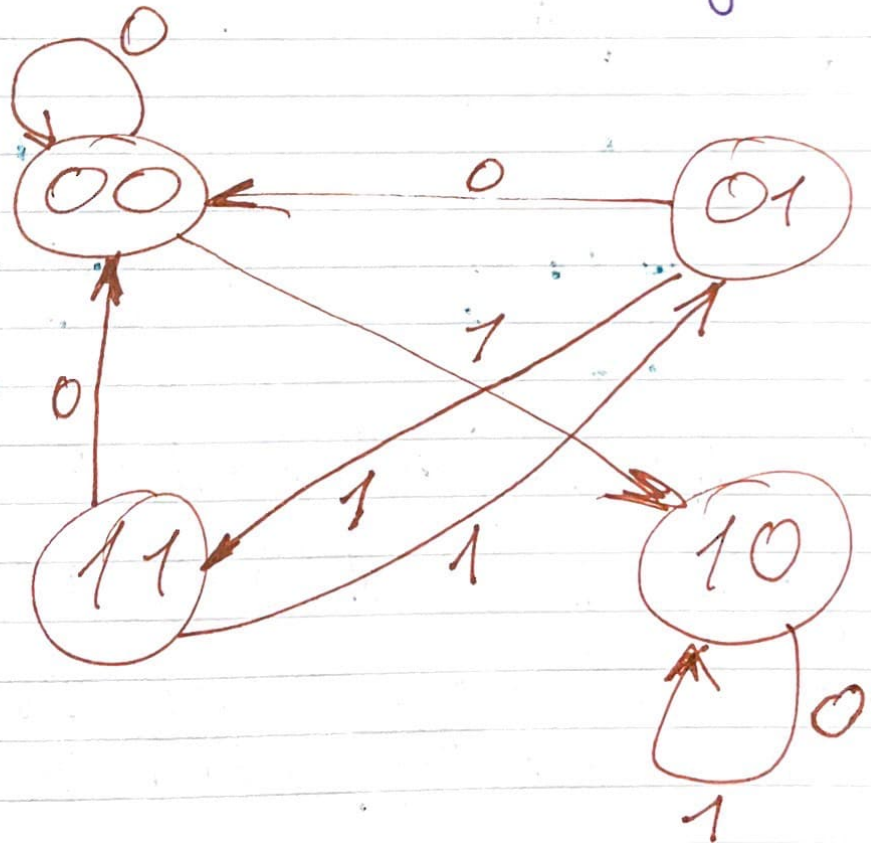
$Q_B(t+1) = J_B Q' + K_B' Q = x \cdot B + A \cdot B$

expression for B JK FF

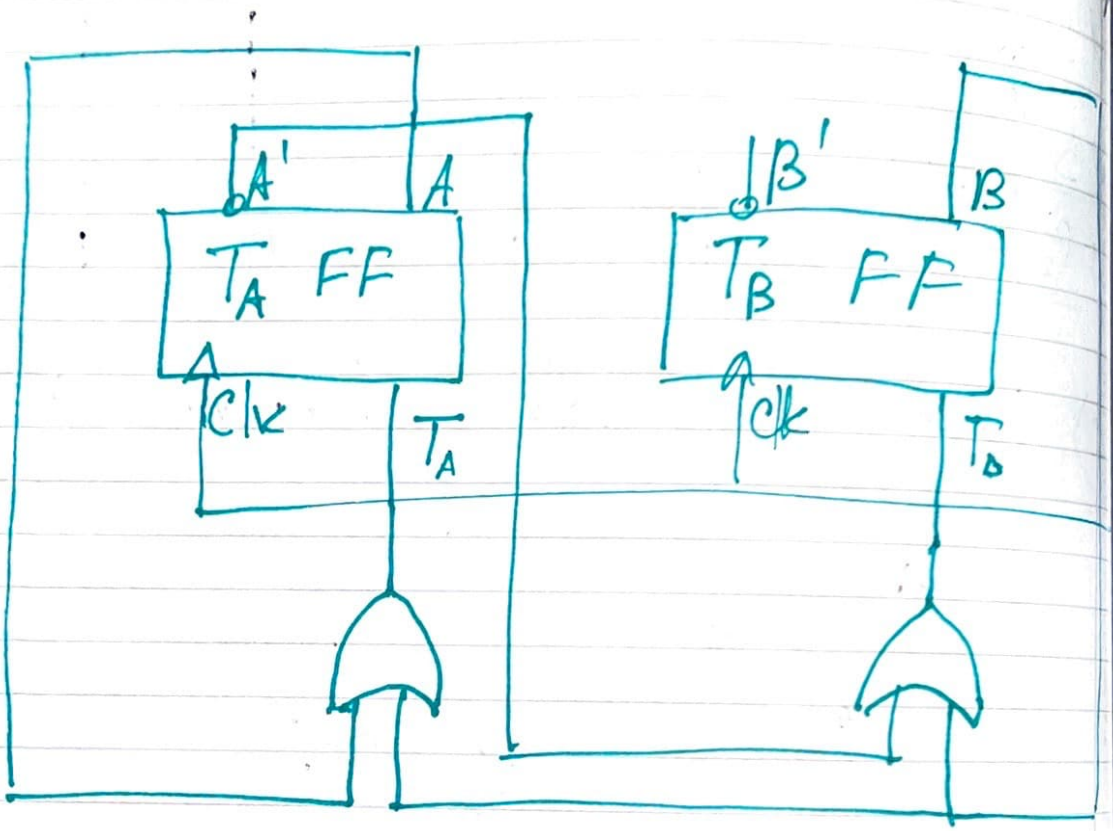
b) List the stable for the sequential circuit

	Present State A(t)	Present State B(t)	Input X	Next State A(t+1)	Next State B(t+1)	Output Y
00 S_0	0	0	0	0	0	
	0	0	1	1	0	
01 S_1	0	1	0	0	0	
	0	1	1	1	1	
10 S_2	1	0	0	1	0	
	1	0	1	1	0	
11 S_3	1	1	0	0	0	
	1	1	1	0	1	

c) Draw the state diagram of circuit



6. Derive the state table and the state diagram of the sequential circuit shown in the following figure. Explain the function that the circuit



$$A(t+1) = T_A = A(t) + B(t) = A + B$$

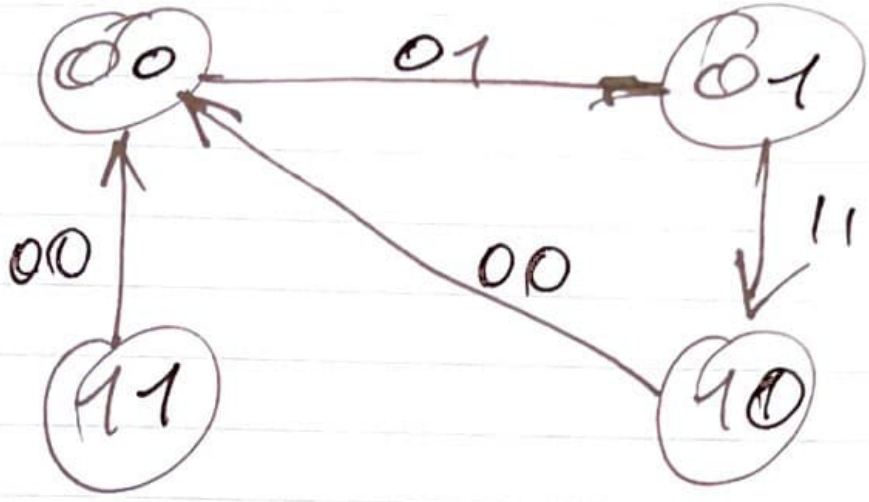
$$B(t+1) = T_B = B(t) + A'(t) = B + A'$$

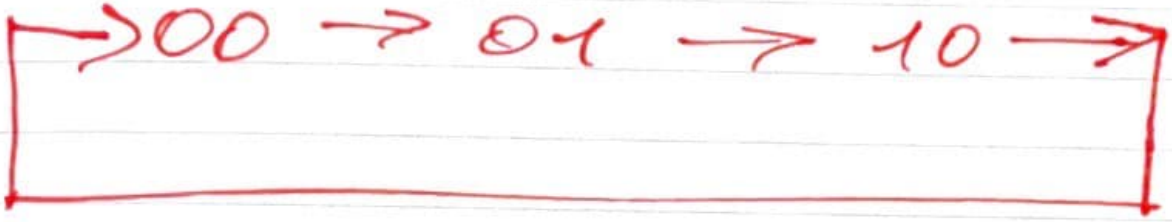
~~Inputs~~ T_A ~~T_B~~	Present State $A(t)$	$B(t)$	Inputs T_A	T_B	Next State $A(t+1)$	$B(t+1)$
	0	0	0	1	0	1
	0	1	1	1	1	0
	1	0	1	0	0	0
	1	1	1	1	0	0

① First we have to find inputs T_A, T_B values from equation base 4 combinations

② Now we have everything to find Next state

Based on characteristic of TFF
$Q(t+1) = T \oplus Q$ we find Next State





repeated circle

This circuit is a counter with repeated sequence of 00, 01, 10.