

b) Tabulate the state Table.

$$Z = Axy + Bx'y$$

Present state		Inputs		next state		output	Flip Flop outputs			
A	B	x	y	A	B	Z	J <sub>A</sub>	K <sub>A</sub>	J <sub>B</sub>	K <sub>B</sub>
0	0	0	0							
0	0	0	1							
0	0	1	0							
0	0	1	1							
0	1	0	0							
0	1	0	1							
0	1	1	0							
0	1	1	1							
1	0	0	0							
1	0	0	1							
1	0	1	0							
1	0	1	1							
1	1	0	0							
1	1	0	1							
1	1	1	0							
1	1	1	1							

c) Derive the state Equation for

A & B (next state)

$$\begin{aligned}
A(t+1) &= J_A A' + K_A A \\
&= (Bx + B'y')A' + (B'xy')A \\
&= A'Bx + A'B'y' + (B'x' + y')A \\
&= A'Bx + A'B'y' + A'Bx + A'y \\
&= B(A + A'x) + Ay + Ax' + A'B'y' \\
&= B(A + A)(A + x) + Ay + Ax' + A'B'y' \\
&= Ax' + Ay + AB + Bx + A'B'y'
\end{aligned}$$

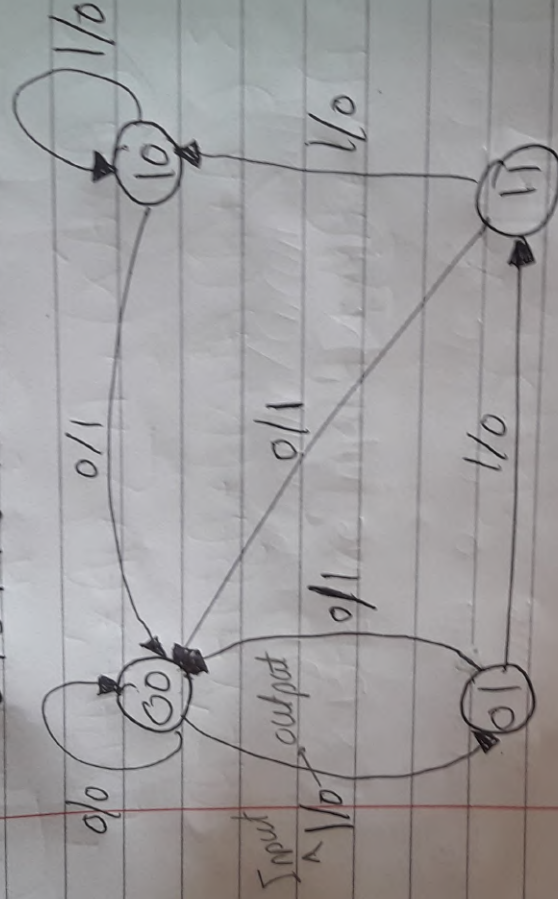
$$\begin{aligned}
B(t+1) &= J_B B' + K_B B \\
&= (A'x)B' + (A + xy')'B \\
&= A'B'x + [A' : (x' + y)]B \\
&= A'B'x + A'B'x' + A'B'y \\
&= A'B'x + A'B(x' + y)
\end{aligned}$$



[5.11] Starting from state  $[00]$  in the state diagram in Figure

Determine the state transitions & output sequence that will be generated when an input sequence of

01011011101110 is applied.



Present state	00	00	01	00	01	11	00	01	11	10	10
Input	0	1	0	1	1	0	1	1	1	1	0
Output	0	0	1	0	0	1	0	0	0	0	0
Next state	00	01	00	01	11	00	01	11	10	10	00



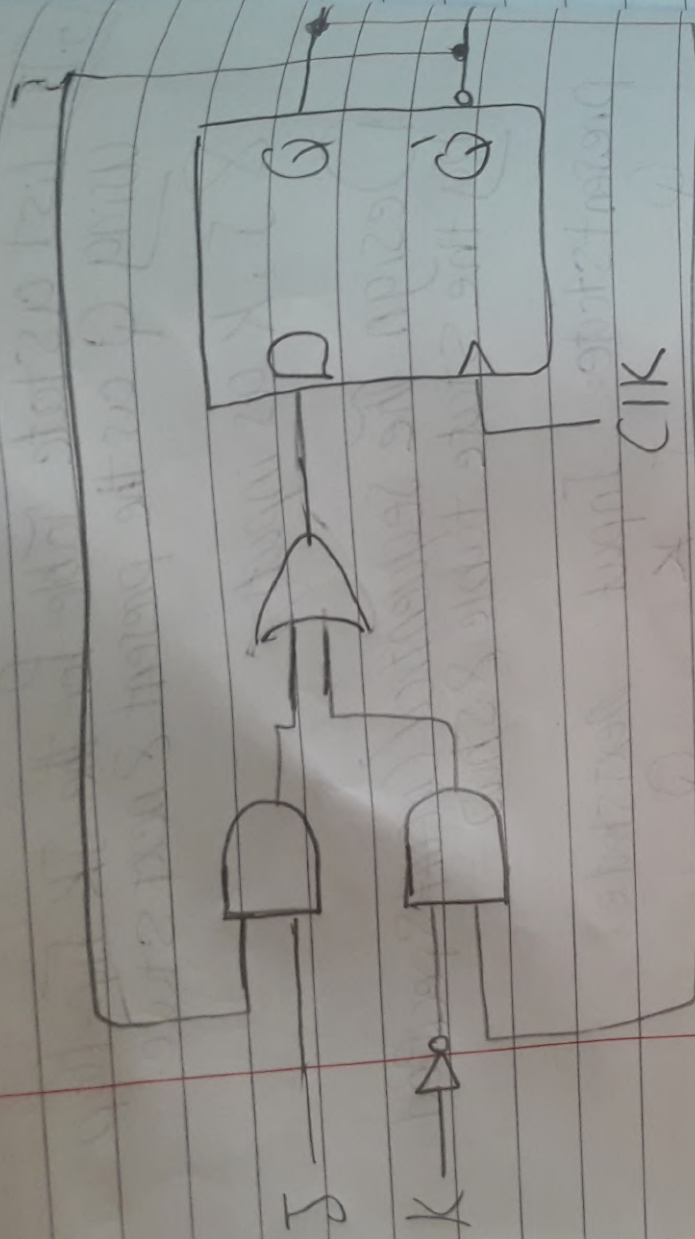
**5.15** List a state table for the JK Flip-Flop.  
 Using  $Q$  as the present & next state.  
 &  $J, K$  as inputs.

Design the sequential circuit specified by the state table.

present state: Input next state.

$Q$	$J$	$K$	$Q$
0	0	0	0 $\rightarrow$ No change
0	0	1	0 $\rightarrow$ Reset to 0
0	1	0	1 $\rightarrow$ Set to 1
0	1	1	1 $\rightarrow$ Complement
1	0	0	1 $\rightarrow$ No change
1	0	1	0 $\rightarrow$ Reset to 0
1	1	0	1 $\rightarrow$ Set to 1
1	1	1	0 $\rightarrow$ Complement

$$Q(t+1) = JQ' + K'Q + KQ$$



5.16 Design a sequential circuit with two flip-flops  
A & B & one input  $X_{in}$

a When  $X_{in} = 0$  The state of the circuit remains the same

When  $X_{in} = 1$  The circuit goes through the state transitions from 00 to 01, to 11 to 10 back to 00 & repeats.

$$D_A = A'X' + B'X$$

$$D_B = A'X + B'X'$$



present state

Input

next state

X <sub>-11</sub> (x)			
A	B	A	B
0	0	0	0
0	0	0	1
0	1	0	1
0	1	1	1
1	0	1	0
1	0	0	0
1	1	1	0
1	1	1	0

(5.9) مسألة

## State Diagram

