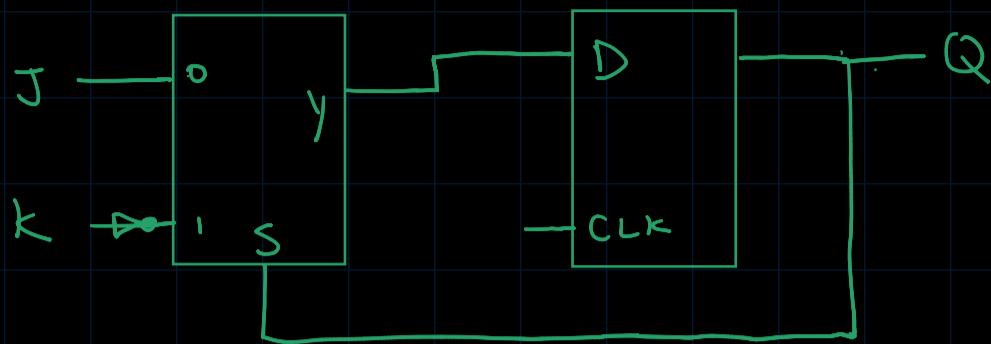


5.2 Construct a JK flip-flop using a D flip-flop, a two-to-one multiplexer and an inverter.



$$Q_{n+1} = JQ' + K'Q$$

5.6 A sequential circuit with two D flip-flops A and B, two inputs, x and y; and one out z is specified by the following next-state and output equations:

$$A(t+1) = xy' + xB$$

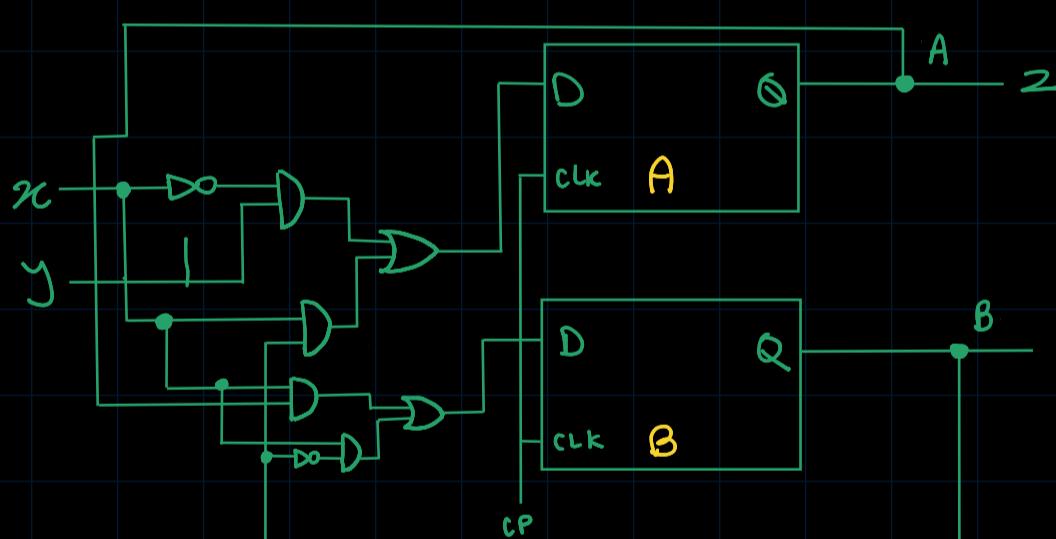
$$B(t+1) = xA + xB'$$

$$z = A$$

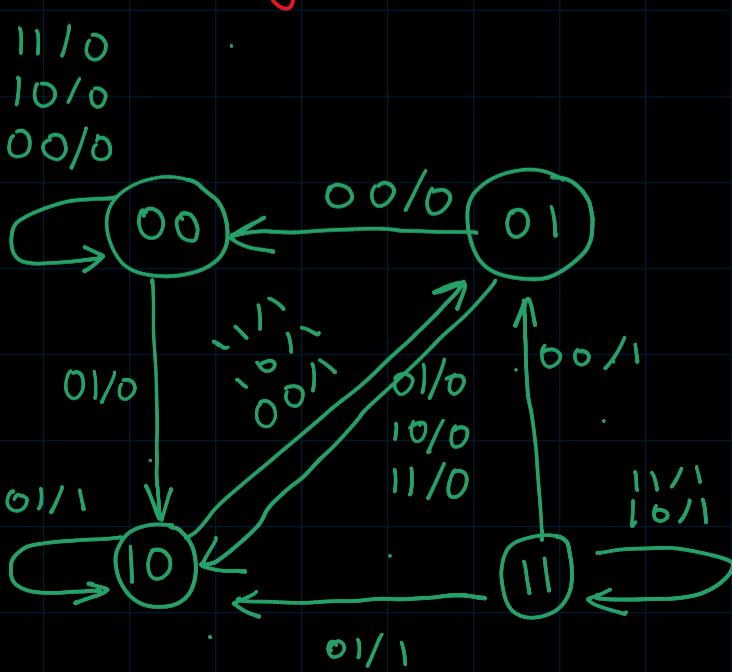
- Draw the logic diagram of the circuit
- List the state table for the sequential circuit
- Draw the corresponding state diagram

State Table

Present State		Inputs		Next State		Out
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	0	0
0	1	0	0	0	0	0
0	1	0	1	1	0	0
0	1	1	0	1	0	0
0	1	1	1	1	1	0
1	0	0	0	0	0	1
1	0	0	1	1	0	1
1	0	1	0	0	1	1
1	0	1	1	1	0	1
1	1	0	0	0	0	1
1	1	0	1	1	0	1
1	1	1	0	1	1	1
1	1	1	1	1	1	1



State Diagram



5.9 A sequential circuit has two JK flip-flop A and B and one input x. The circuit is described by the following flip-flop equations:

$$J_A = x \quad K_A = B$$

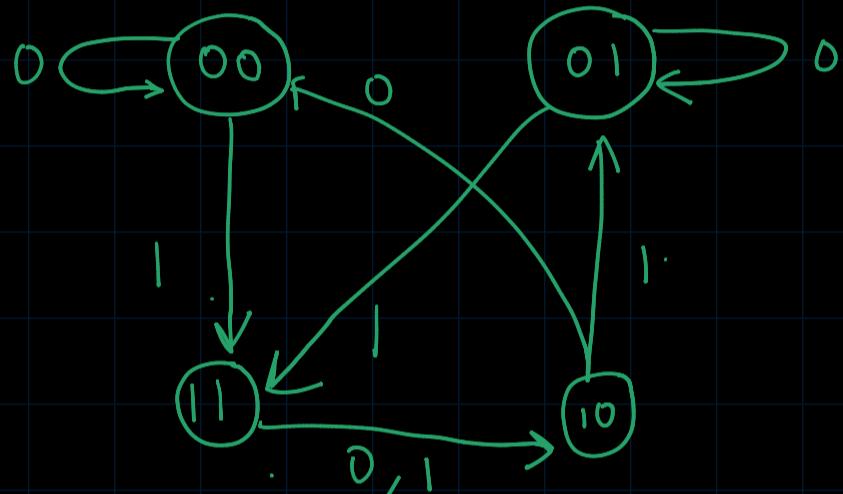
$$J_B = x \quad K_B = A'$$

- a) Derive the state equations $A(t+1)$ and $B(t+1)$ by substituting the input equations for the J and K variables
 b) Draw the state diagram of the circuit

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

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

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

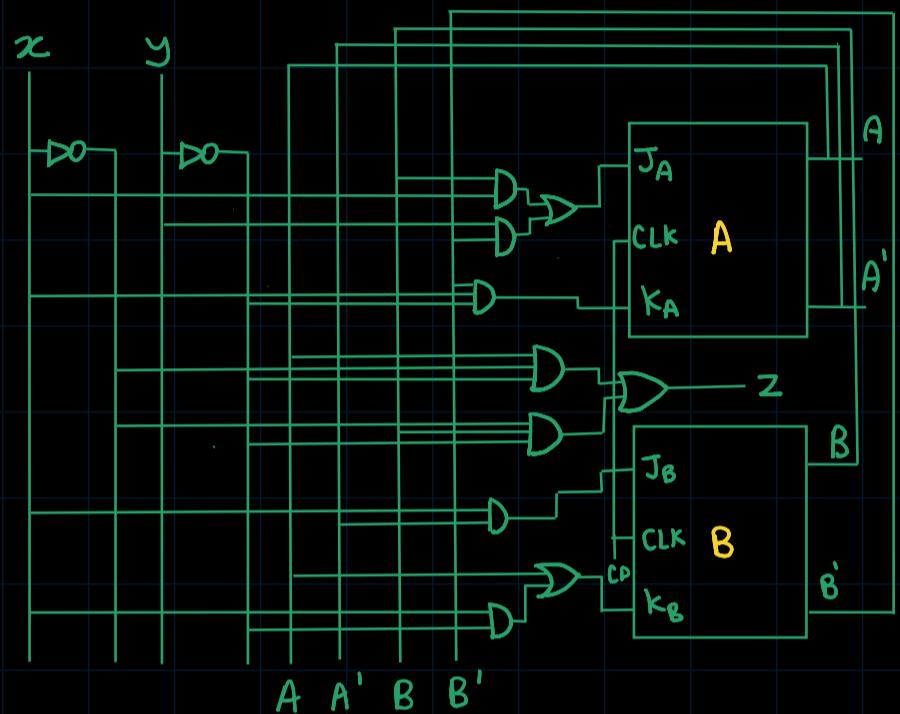


A	B	x	A(t+1)	B(t+1)
0	0	0	0	0
0	0	1	1	1
0	1	0	0	1
0	1	1	1	1
1	0	0	0	0
1	0	1	0	1
1	1	0	1	0
1	1	1	1	0

A sequential circuit has two JK flip-flops A and B, two inputs x and y, and output z. The flip-flop input equations and circuit output equation are:

$$\begin{aligned} J_A &= Bx + B'y' & K_A &= B'xy' \\ J_B &= A'x & K_B &= A + xy' \\ z &= Ax'y' + Bx'y \end{aligned}$$

- Draw the logic diagram of the circuit
- Tabulate the state table
- Derive the state table equations for A and B

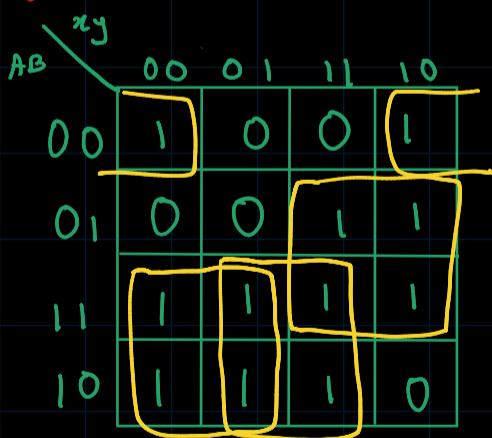


$$Q_{(t+1)} = JQ' + K'Q$$

$$\therefore A(t+1) = J_A A' + K_A' A$$

$$B(t+1) = J_B B' + K_B' B$$

Kmap for A



$$A(t+1) = A x' + A y + B x + A' B' y'$$



Kmap for B

A	B	x	y	A(t+1)	B(t+1)	z	J _A	K _A	J _B	K _B
0	0	0	0	1	0	0	1	0	0	0
0	0	0	1	0	0	0	0	0	0	0
0	0	1	0	1	1	1	0	1	1	1
0	0	1	1	0	1	1	0	0	0	1
0	1	0	0	0	1	1	0	0	0	0
0	1	0	1	0	1	1	0	0	0	0
0	1	1	0	1	1	0	0	1	0	1
0	1	1	1	1	1	1	0	1	0	0
1	0	0	0	1	0	0	0	1	0	0
1	0	0	1	0	1	0	0	0	0	0
1	0	1	0	1	1	1	0	1	0	0
1	0	1	1	1	1	0	0	1	0	1
1	1	0	0	1	0	0	0	0	0	0
1	1	0	1	1	1	0	0	1	0	0
1	1	1	0	1	0	0	0	0	0	0
1	1	1	1	1	1	1	0	1	0	0

$$B(t+1) = A'Bx' + A'B'x + A'By$$

