Sequential Circuit Analysis

⟹ Circuit diagram → State diagram

Steps:

(i) Find how many Flip-Flop(s) are there.

(ii) Determine,

(i) Present States. (number of present states = number of FlipFlop in the circuit)

(ii) Next States. (number of next states = number of FlipFlop in the circuit)

(iii) Input (Flip Flop inputs and external input)

(iv) Output (External output if any)

(iii) Find the equations for

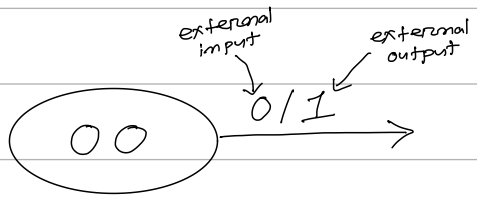
(i) All the flipflop inputs.

(ii) External output (if any)

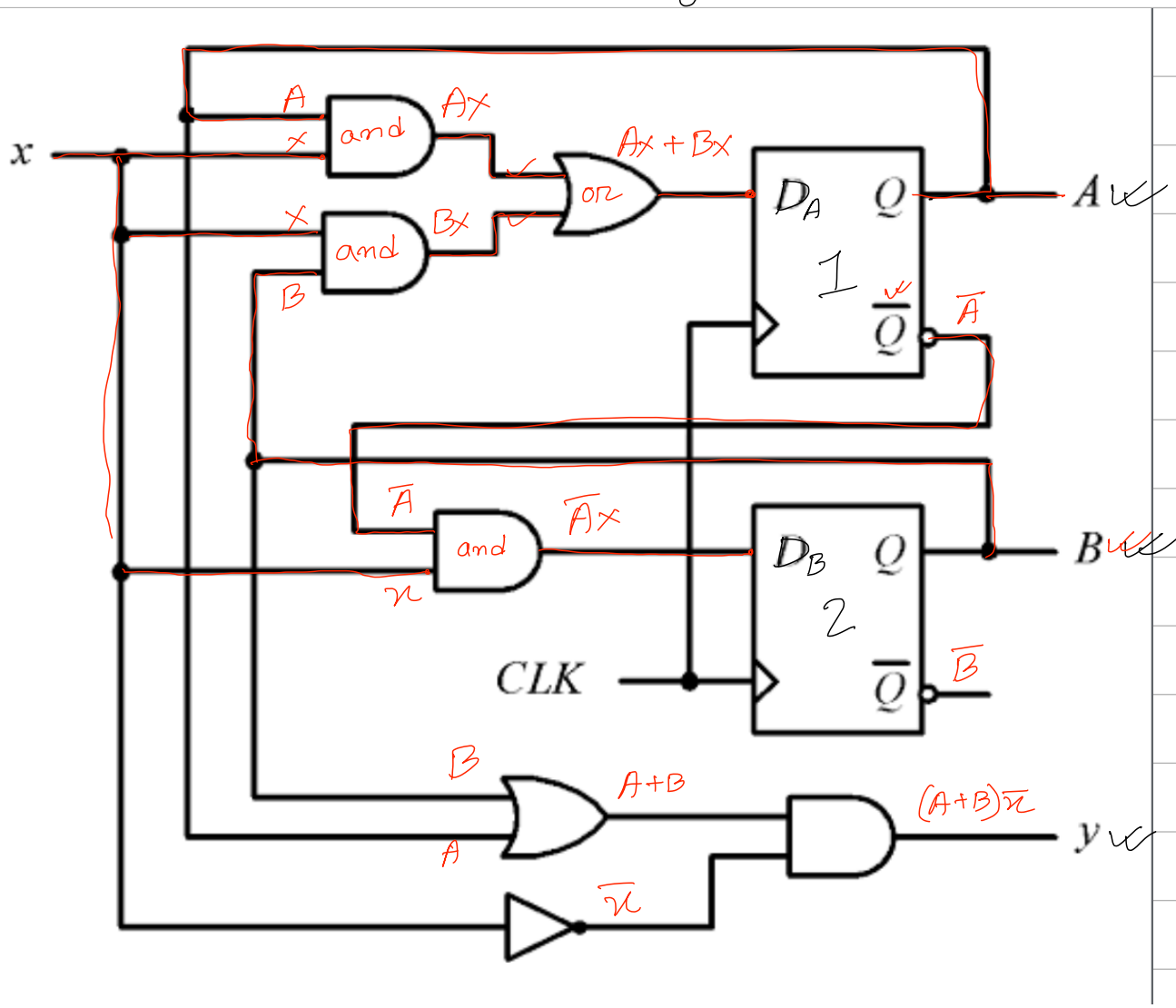
(iv) Construct the State table - according to the equations you created in step(iii)

(v) Extend the state table and find next states from the flipflop input values. [Use characteristic table to do so).

(vi) Finaly draw the state diagram.



Draw the state Diagram:



present state: A, B (A(t), B(t))

Next State : A^+, B^+ (A(t+1), B(t+1))

Input : D_A, D_B, x

Output : y

Equations : $D_A = Ax + Bx$

$D_B = \overline{A}x$

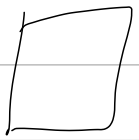
$y = (A+B)\overline{x}$

Present State of f.f-1 | Present State of f.f-2 | Ext. inp.

	A	B	x	D_A	D_B	y
1	0	0	0	0	0	0
1	0	0	1	0	1	0
1	0	1	0	0	0	1
1	0	1	1	1	1	0
	1	0	0	0	0	1
	1	0	1	1	0	0
	1	1	0	0	0	1
	1	1	1	1	0	0

Characteristic table

Q(t)	D	Q(t+1)



A	B	x	D_A	D_B	y	A^+	B^+
0	0	0	0	0	0	0	0
0	0	1	0	1	0	0	1
0	1	0	0	0	1	0	0
0	1	1	1	1	0	1	1
1	0	0	0	0	1	0	0
1	0	1	1	0	0	1	0
1	1	0	0	0	1	0	0
1	1	1	1	0	0	1	0

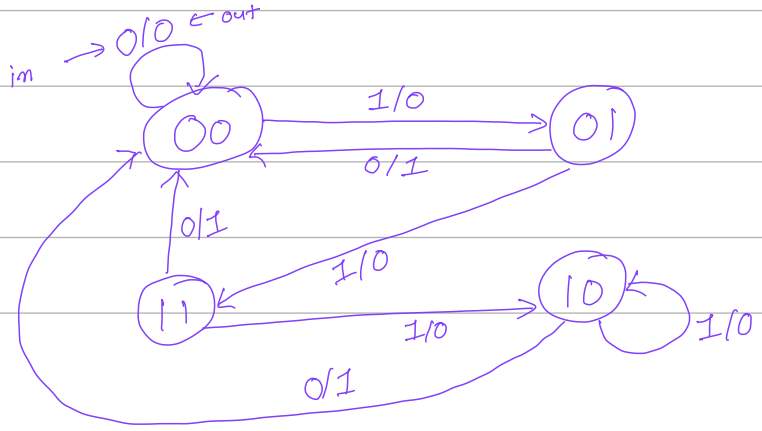
Characteristic table:

A	Q(t)	D_B	Q(t+1)/A^+
	0	0	0
	0	1	1
	1	0	0
	1	1	1

2 → AB → Y

ABC

(0 - 7)



State Diagram to Circuit:

(i) Draw the state table from the state diagram.

(ii) Extend the table and figureout the input(s) of the flip-flops.

use excitation table to do so.

(iii) Draw k-map(s) for all the flip-flop input(s) and external output (if any exists)

(iv) Draw the diagram.

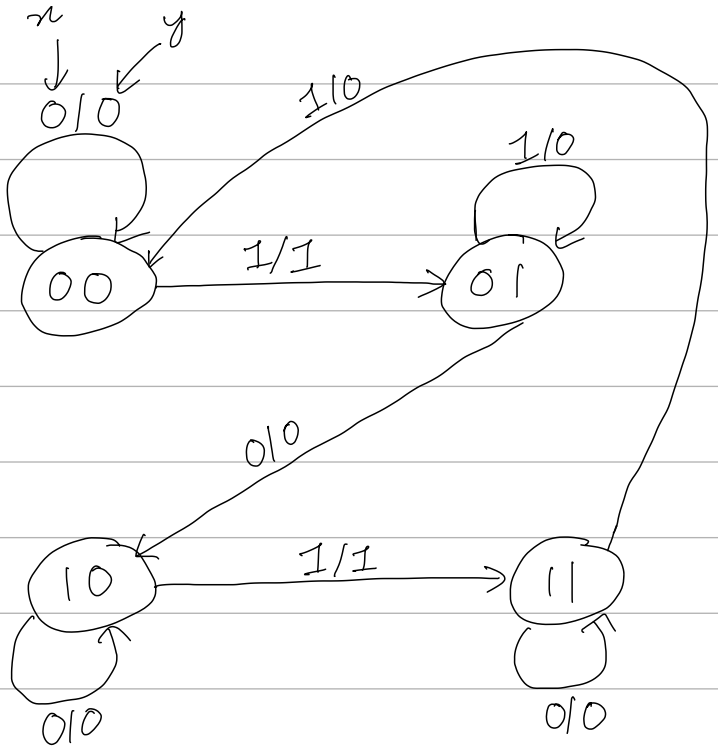
↳ No. of Flip-Flop = No. of present states.

D Flip-Flip

A B

0 0 } 2 F.F

0 1



Present | Next | ext. output → K-Map

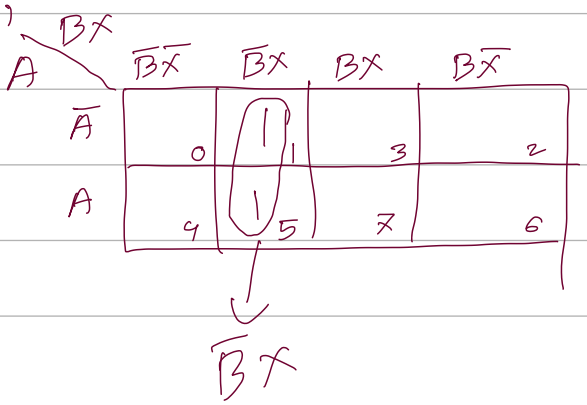
A_-	B_-	x_-	A^+	B^+	y	D_A	D_B
0	0	0	0	0	0	0	0
0	0	1	0	1	1 ✓	0	1
0	1	0	1	0	0	1	0
0	1	1	0	1	0	0	1
1	0	0	1	0	0	1	0
1	0	1	1	1	1 ✓	1	1
1	1	0	1	1	0	1	1
1	1	1	0	0	0	0	0

Excitation table:

$Q(t)$ ✓	$Q(t+1)$ ✓	D ✓
0	0	0
0	1	1
1	0	0
1	1	1

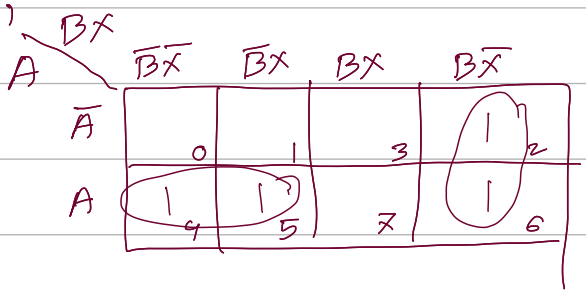
A, B, x

For y,



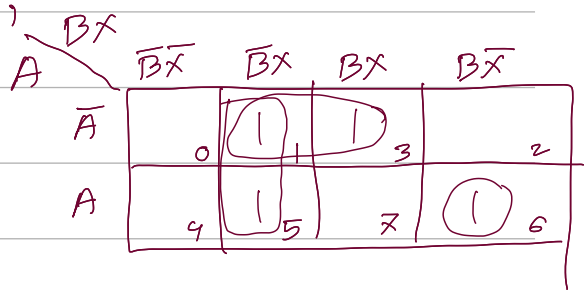
$Y = \bar{B}X$

For D_A,



$D_A = A\bar{B} + B\bar{X}$

For D_B,



$D_B = \bar{B}X + \bar{A}X + AB\bar{X}$