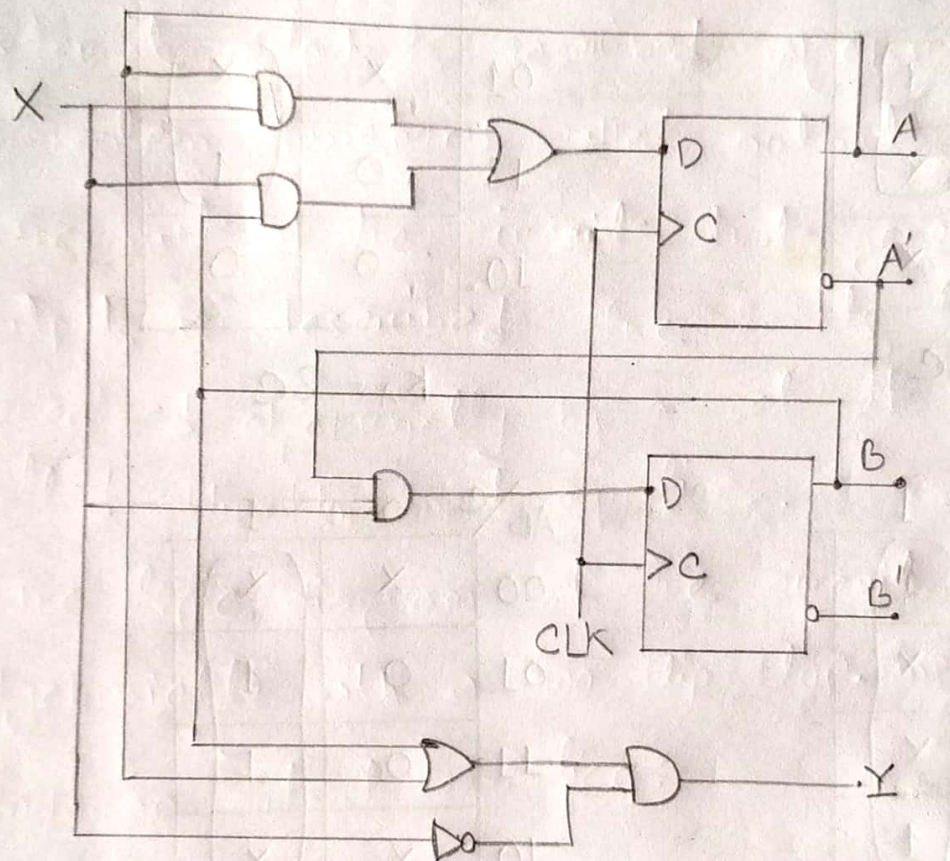


Example of Sequential circuit



State Equation

$$A(t+1) = A(t) \times (t) + B(t) \times (t)$$

$$B(t+1) = A'(t) \times (t)$$

$$Y(t) = (A(t) + B(t)) X(t)'$$

* This ~~equa~~ sequential circuit consists of two D flip-flops A and B, an input X and an output Y.

State Table

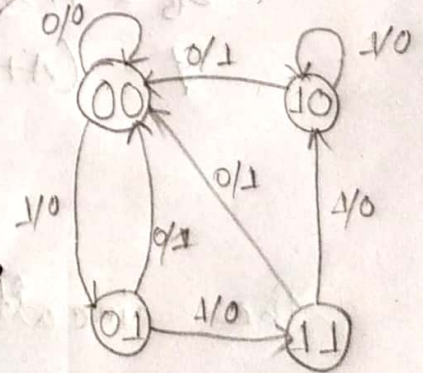
The time sequence of inputs, outputs, and flip-flop states can be enumerated in a state table (sometimes called transition table).

Present State		Input	Next State		Output
A	B	X	A	B	Y
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	0	0	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

State Diagram

The information available in the state table can be represented graphically in the form of a state diagram.

A state is represented by a circle, and the transitions between states are indicated by directed lines connecting the circles.



1/0 : means input = 1, output = 0.

Flip-Flop Input Equations

* The part of the combinational circuit that generates external outputs is described algebraically by a set of boolean functions called output equations. ~~The~~

* The part of the circuit that generates ~~external~~ outputs is ~~described~~ the inputs to flip-flops is described algebraically by a set of Boolean functions called Flip-Flop input equations.

* The logic diagram of the circuit can be expressed algebraically with ~~two~~ flip-flop input equations and an output equation:

$$D_A = AX + BX$$

$$D_B = A'X$$

$$Y = (A+B)X'$$

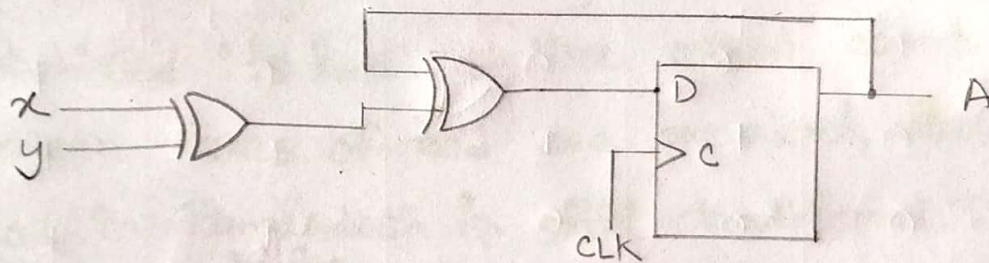
Analysis with D Flip-Flop

The circuit we want to analyze is described by the input equation $D_A = A \oplus X \oplus Y$

* The DA symbol implies a D flip-flop with output A.

* The x and y variables are the inputs to the circuit.

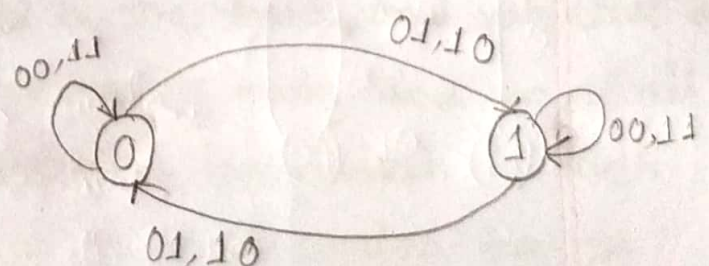
* No output equations are given, so the output is implied to come from the output to the flip-flop.



* The binary numbers under Axy are listed from 000 through 111.

* The next state values are obtained from the state equation $A(t+1) = A \oplus x \oplus y$

Present State A	Inputs x y		Next State A
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1



State Diagram