

Finite State Machines

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FINITE STATE MACHINES.

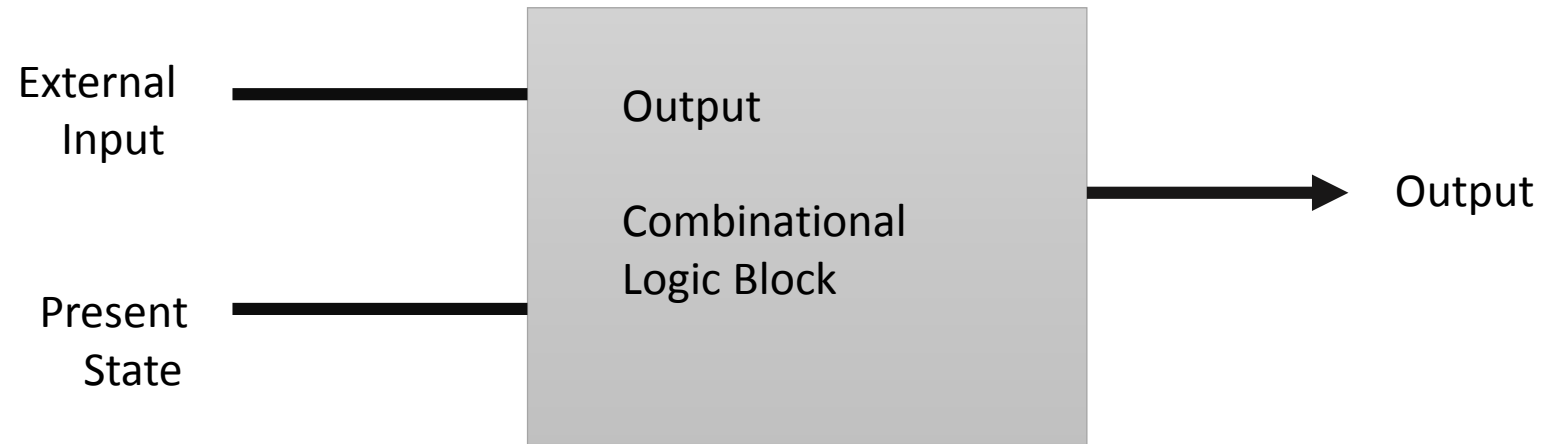
Moore machine:

In the theory of computation, a **Moore machine** is a finite state machine whose output values are determined solely by its current state.

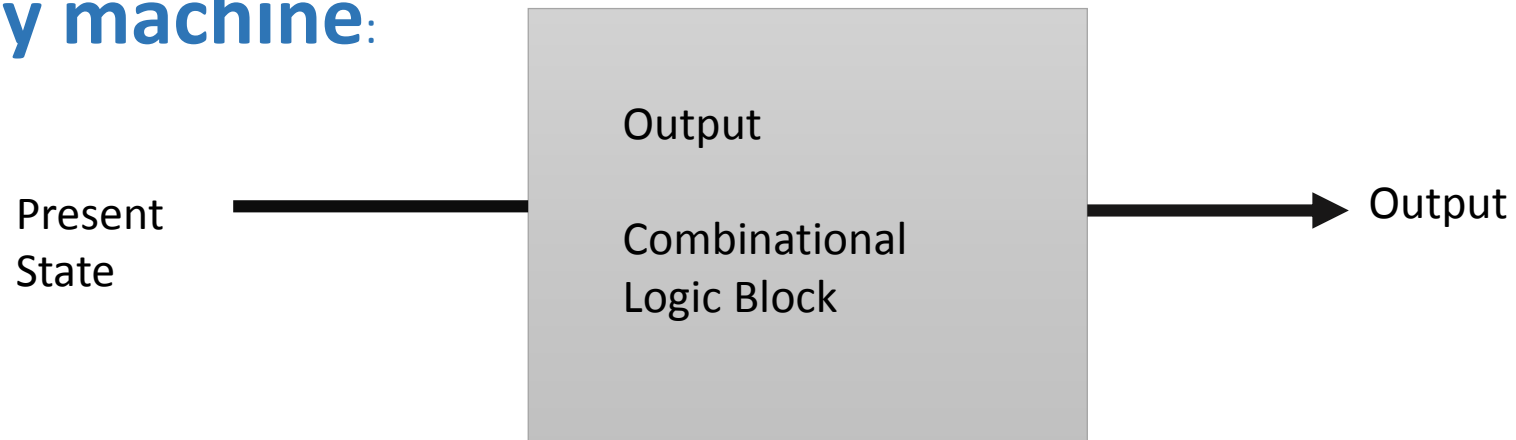
Mealy machine:

In the theory of computation, a **Mealy machine** is a finite-state machine whose output values are determined both by its current state and the current inputs.

Moore machine:



Mealy machine:



Moore Vs Mealy: major differences

1.No.of states:-

A Mealy machine has less number of states than a moore machine.

In a moore machine output is only present state dependent, for each combination we need one state for just giving output.

In Mealy machines multiple states can be shown i.e several possible outputs can be specified in one state.

2.Faster response:-

A mealy machine generates a faster response in comparison with a moore machine.

In a mealy machine output changes when input meet the designated condition.to be precise as soon as input arrives we get output i.e it doesn't wait for the change of state.

A moore machine reacts indirectly to inputs and waits until next state to respond. This implies that the output is delayed by one clock cycle.

3. Control of width and timing of output signal.

In a Mealy machine:

the above factors are decided by the inputs to meet the designated conditions.

1. width varies with input
2. susceptible to glitches on input signal.

In a Moore machine:

1. width of output is same as clock period
2. not susceptible to glitches on input.

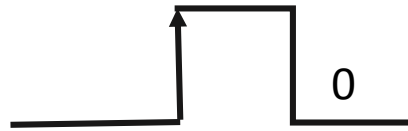
Note: In sequential circuits glitches are avoided easily because of the clock signal.

Control signal:

two types of controls are present

1. Edge sensitive control

output is high only at clock set-up and hold condition

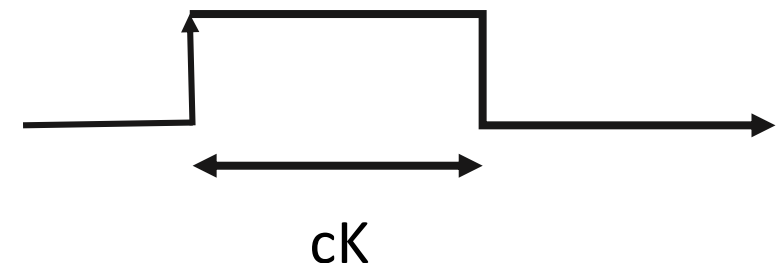


both mealy and moore machines are suitable but mealy is preferable as in consideration with the advantages of mealy over moore .(lesser states and faster response)

2. Level sensitive control

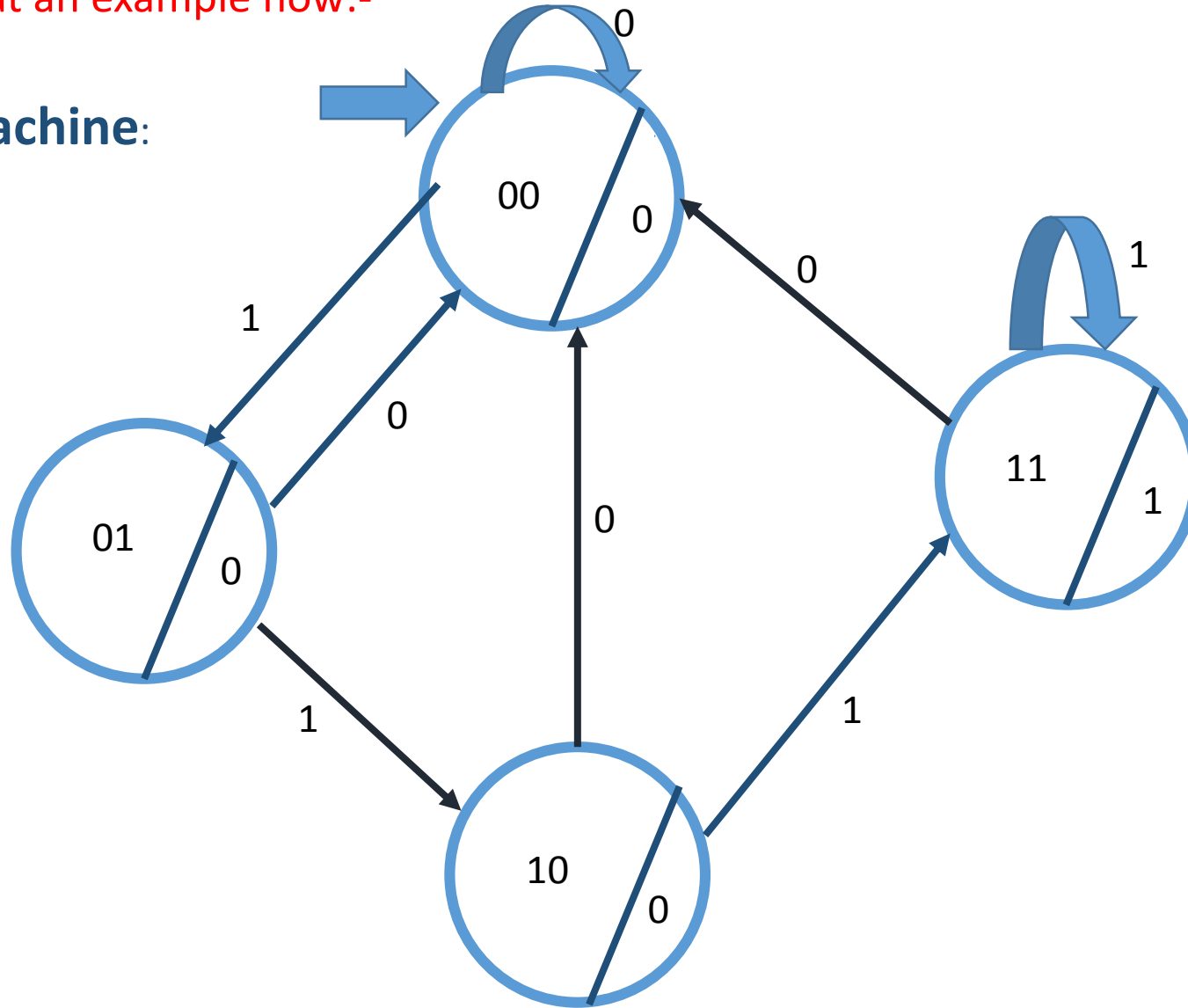
output is high through out the clock signal.

Moore machine is more suitable as mealy machine is susceptible to glitches.

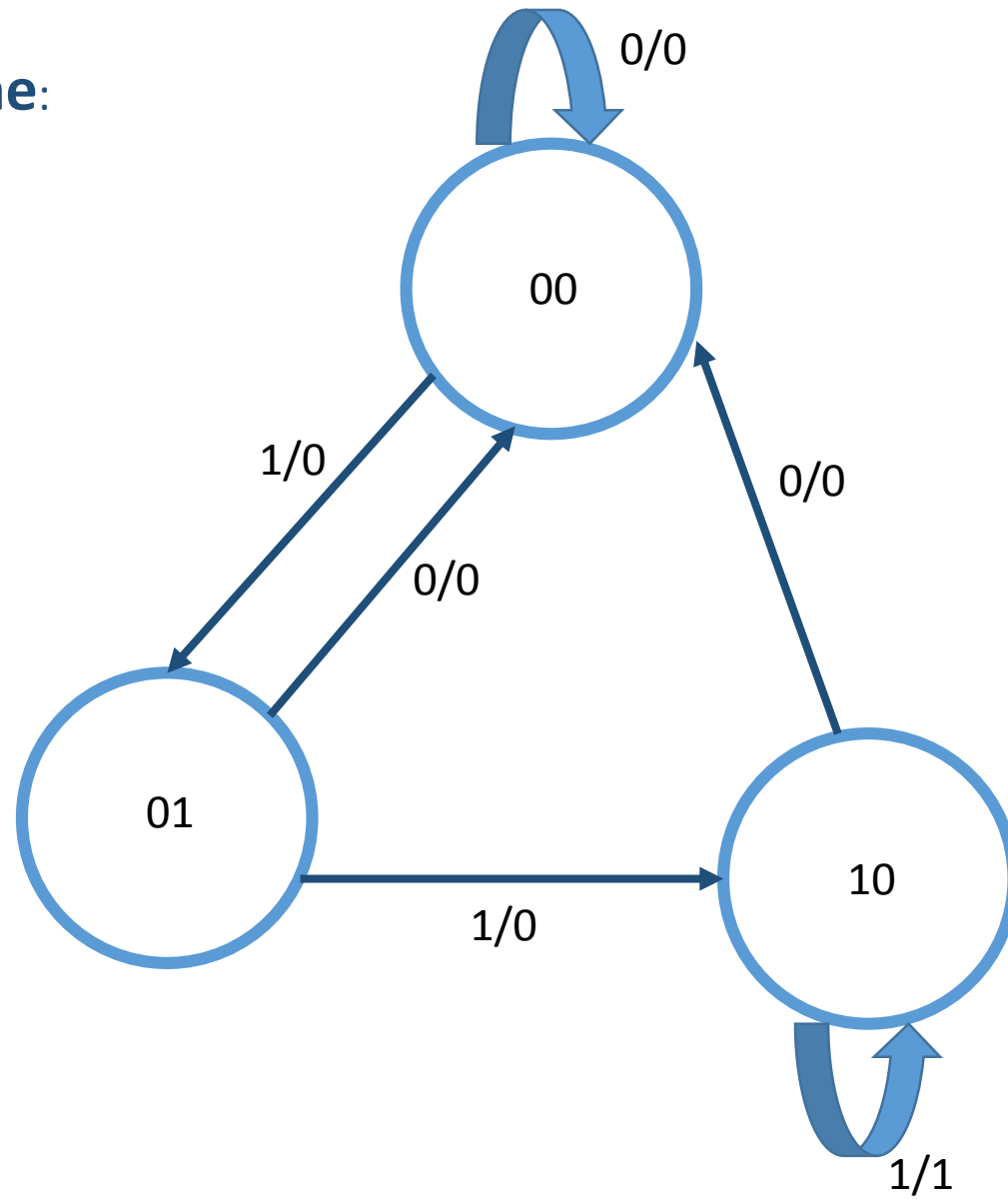


Let us look at an example now:-

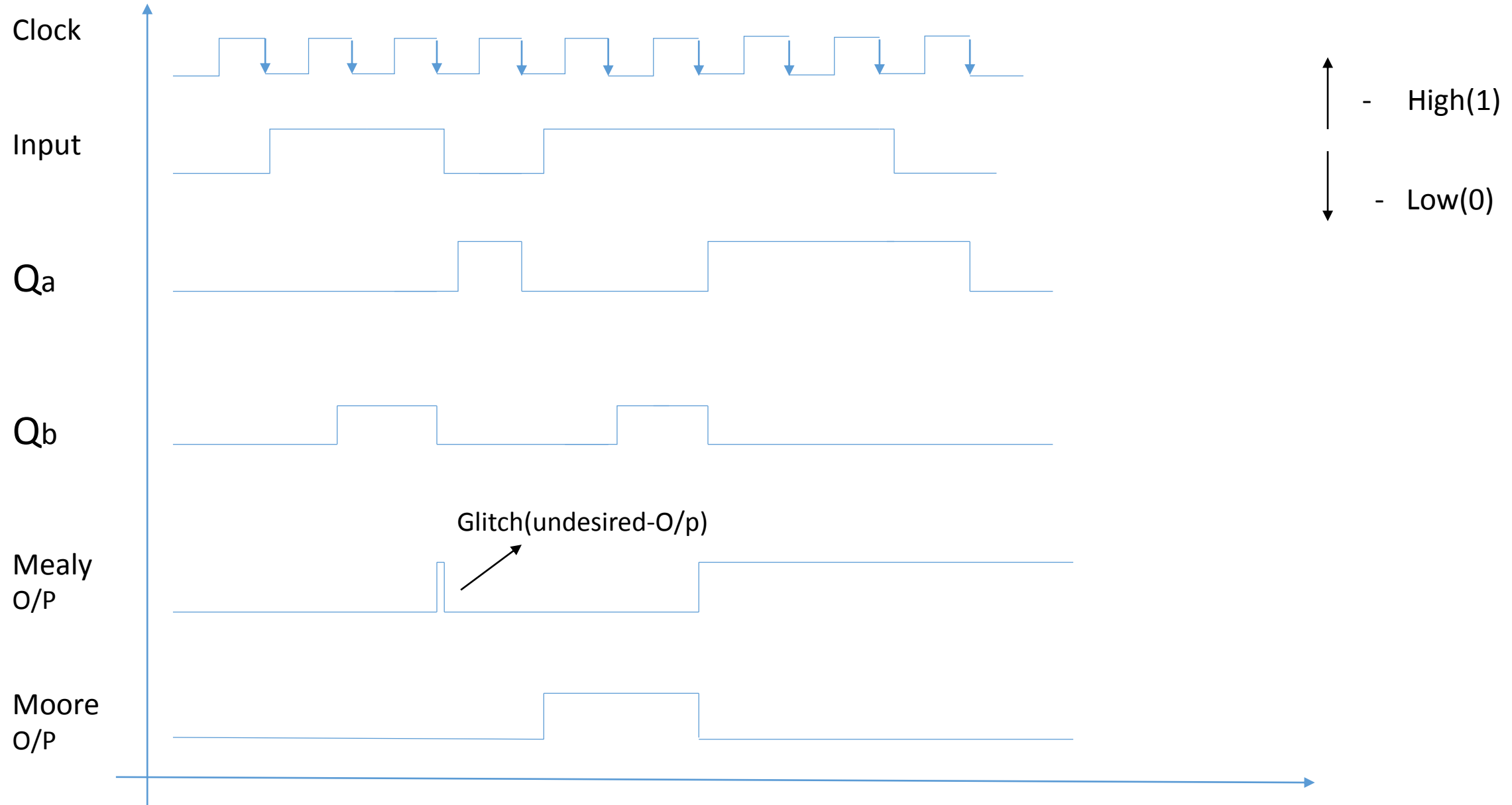
Moore machine:



Mealy machine:



Using Negative edge triggered D-flip flop



Summary:

Mealy machines	Moore machines
1.Current outputs are affected by the current state and the current inputs	1.Current outputs are affected by the current state only
2.Outputs are unstable until current inputs achieve steady states	2.Current outputs are always stable since they depend only on the current state which is always stable
3.Unstable outputs	3.outputs are always stable
4.Require less hardware than Moore Circuits	4.Require more hardware than circuits Mealy circuits
5.Inputs can effect outputs in current clock period	5.Inputs can affect outputs in next clock period