Finite state machines

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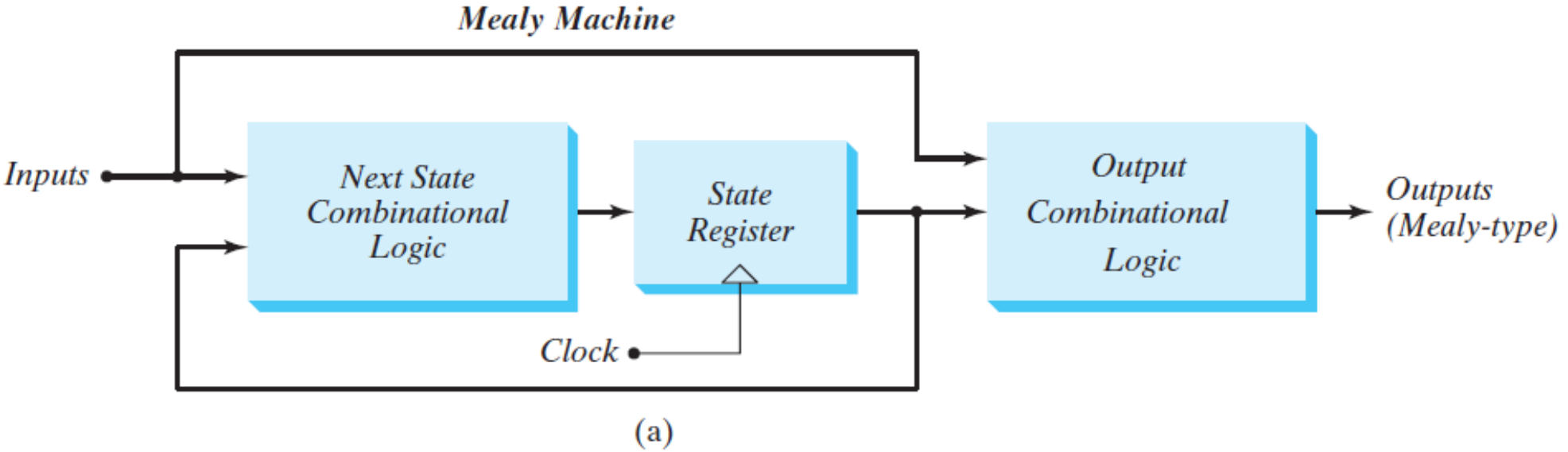
It is customary to distinguish between two models of sequential circuits: the Mealy model and the Moore model. They differ only in the way the output is generated.

Mealy model: output is a function of both the present state and the input.

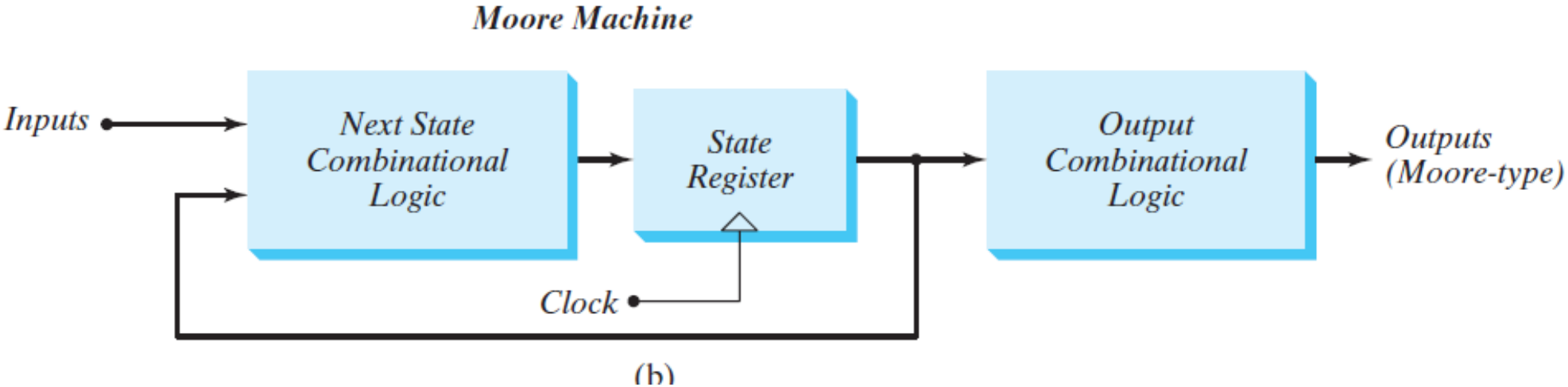
Moore model: output is a function of only the present state.

A circuit with no output is considered a Moore model.

A circuit may have both types of outputs.

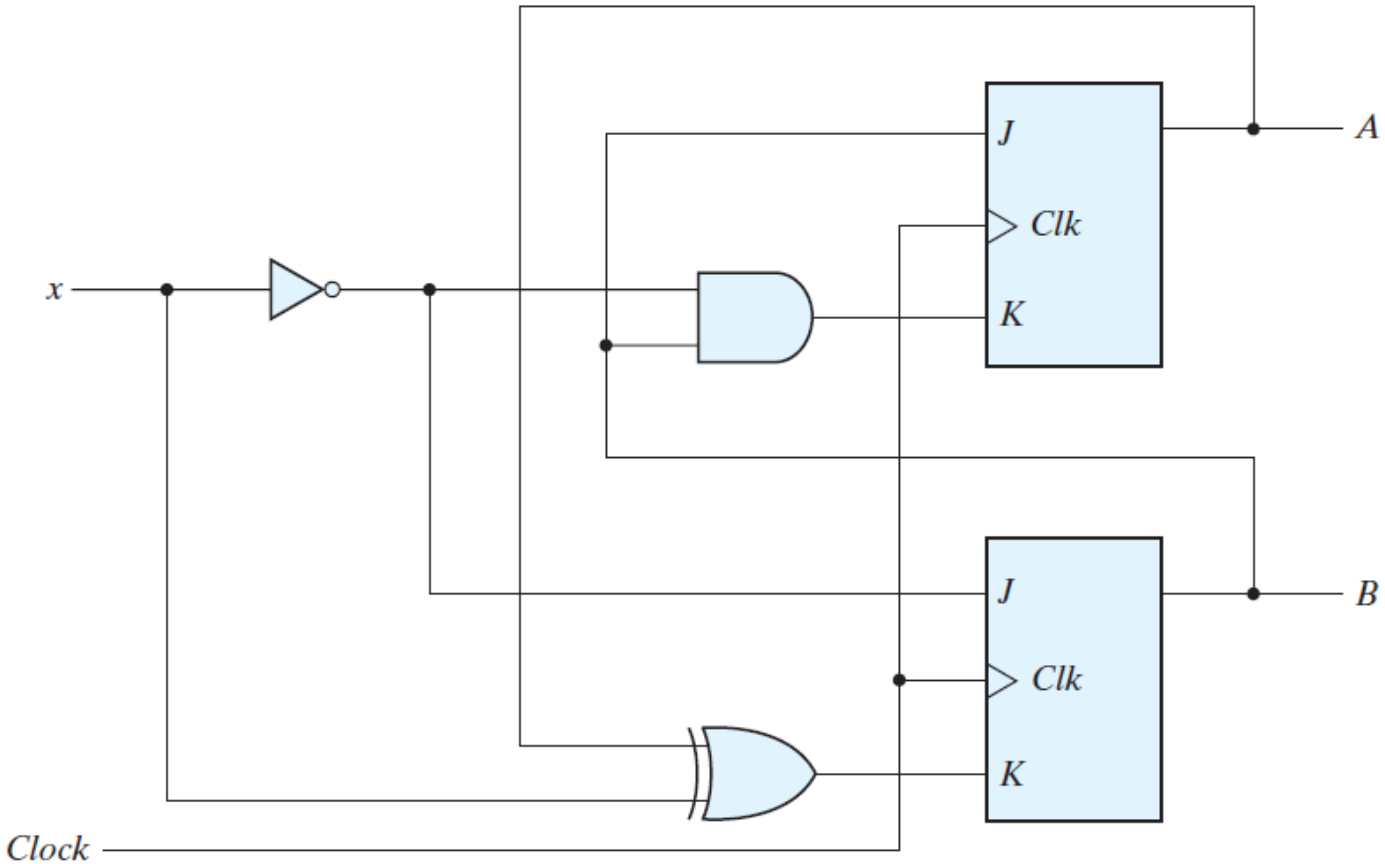

Mealy Machine
Inputs
Next State Combinational Logic
State Register
Clock
Output Combinational Logic
Outputs (Mealy-type)

(a)

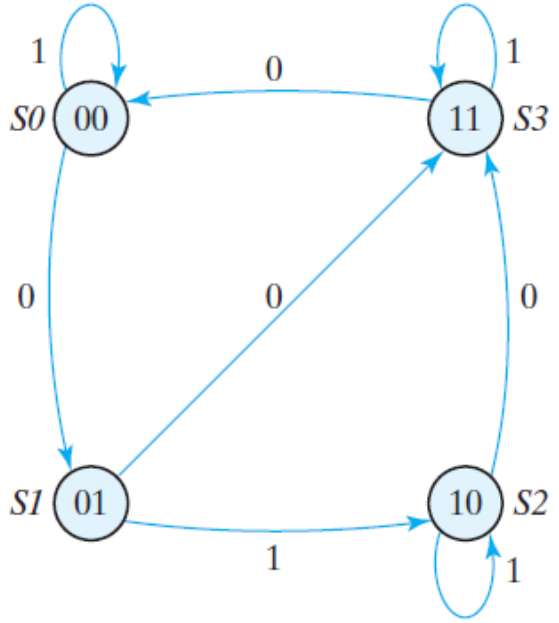

Moore Machine
Inputs
Next State Combinational Logic
State Register
Clock
Output Combinational Logic
Outputs (Moore-type)

(b)

Is it Moore or Mealy machine?

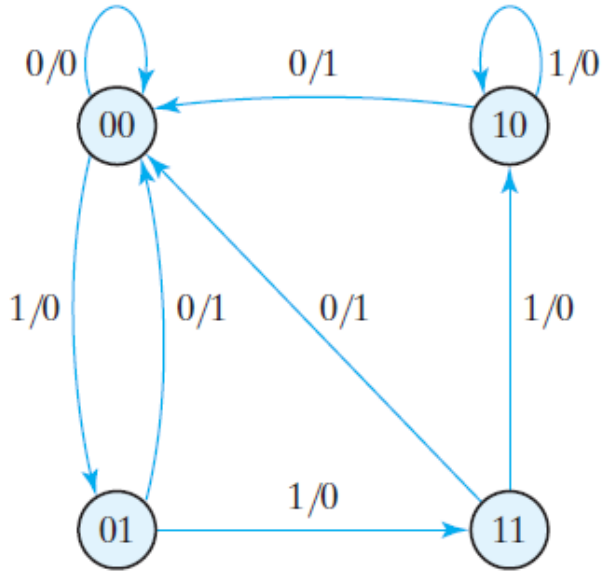


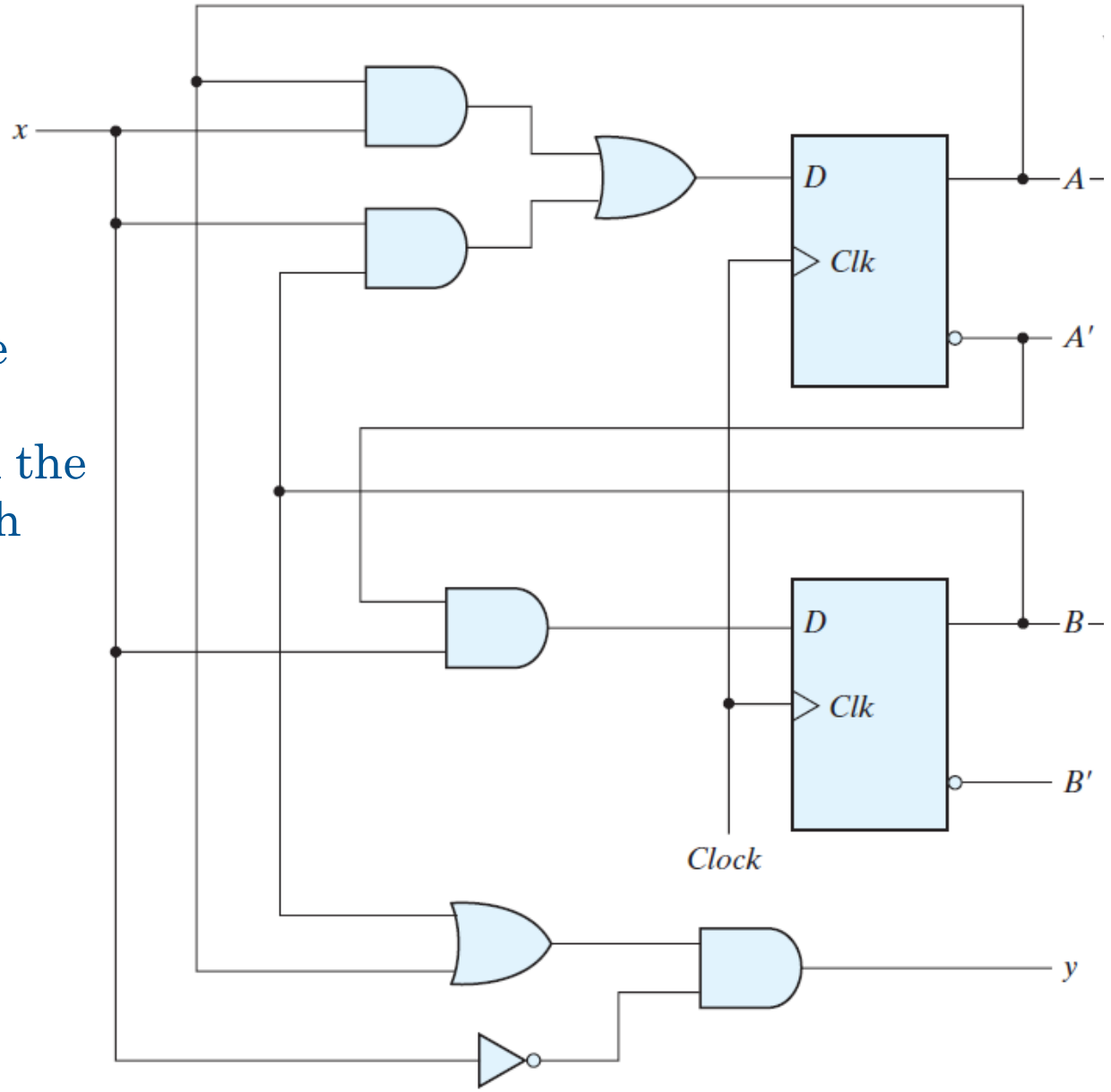
Moore machine.
Output is a function of present state only.
The corresponding state diagram has only inputs marked along the directed lines.
The outputs are the flip-flop states marked inside the circles.



Is it Moore or Mealy machine?

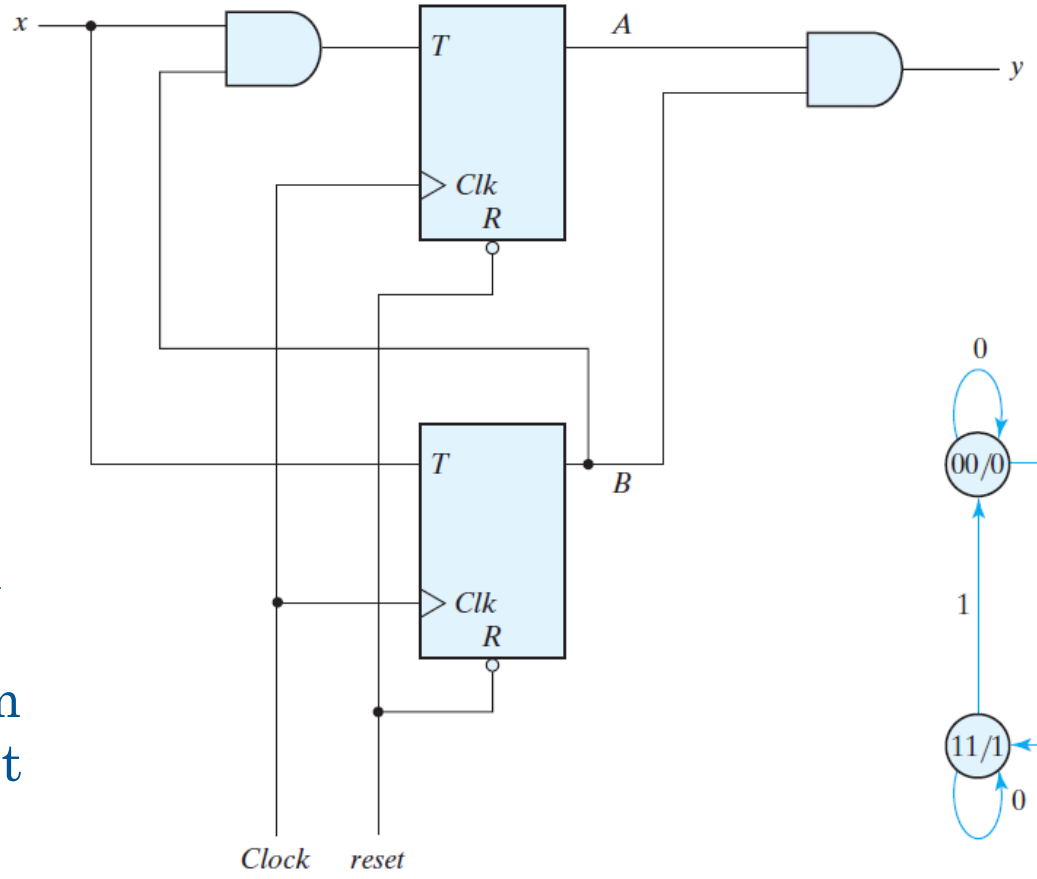
- Mealy machine.
- Output y is a function of both input x and the present state of A and B.
- The corresponding state diagram shows both the input and output values, separated by a slash along the directed lines between the states.



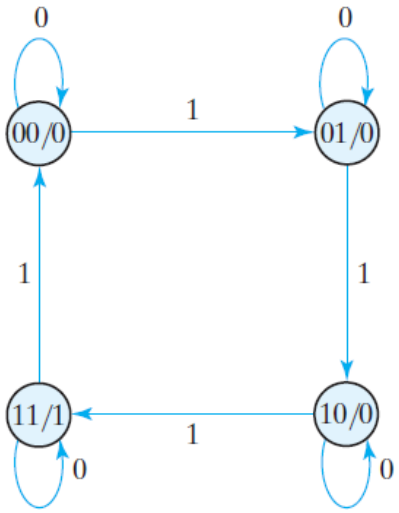


Is it Moore or Mealy machine?

- Moore model.
- Output depends only on flip-flop values, and that makes it a function of the present state only.
- The input value in the state diagram is labeled along the directed line, but the output value is indicated inside the circle together with the present state.



(a) Circuit diagram



(b) State diagram

Mealy

Present State		I/P	Next State		O/P
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

For the same state,
the output changes with the input

Moore

Present State		I/P	Next State		O/P
A	*B*	*x*	*A*	*B*	*y*
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	0	1	0
0	1	1	1	0	0
1	0	0	1	0	0
1	0	1	1	1	0
1	1	0	1	1	1
1	1	1	0	0	1

For the same state,
the output does not change with the input