

Computer Architecture
Lecture Week 6 (Part III)

Finite State Machine for Latches

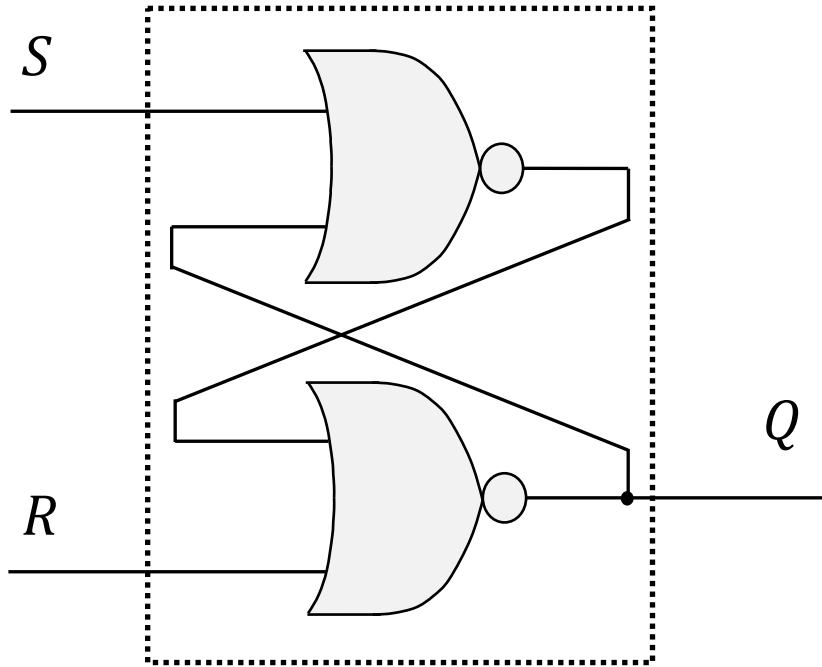
Artem Burmyakov

October 10, 2025



INNOPOLIS
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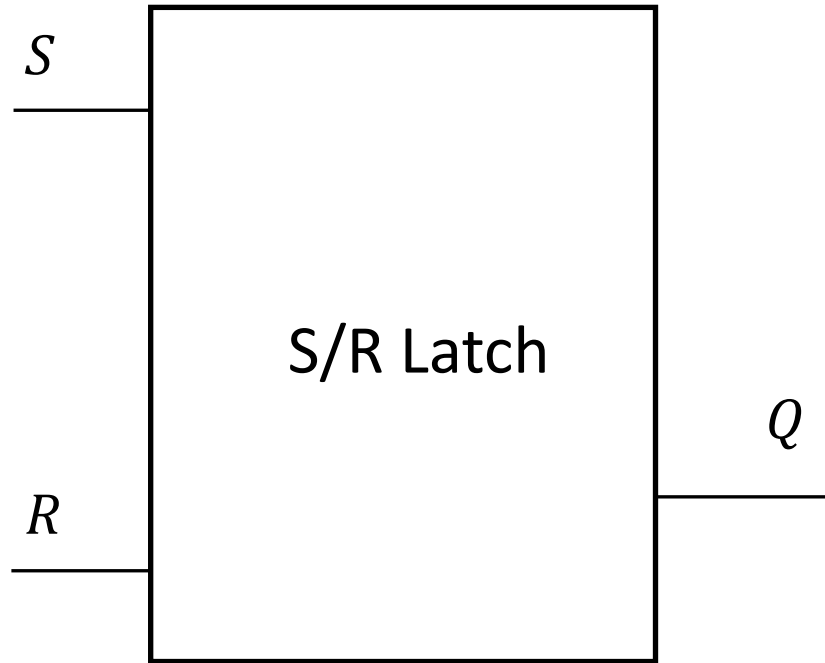
Recap: S/R Latch



Set/Reset Latch
(or transparent latch)

S	R	Q
1	0	1
0	1	0
0	0	Q^{prev}
1	1	Illegal inputs

Recap: S/R Latch Illegal Inputs



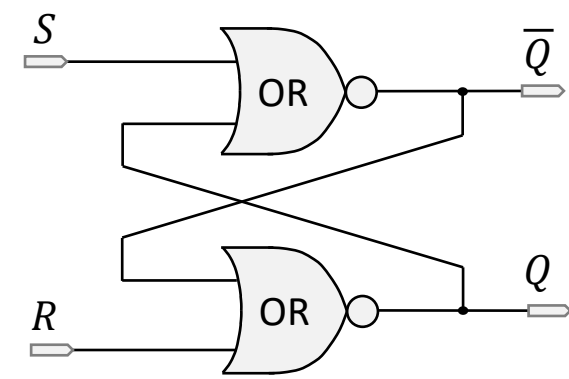
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State Transition Diagram for a Latch

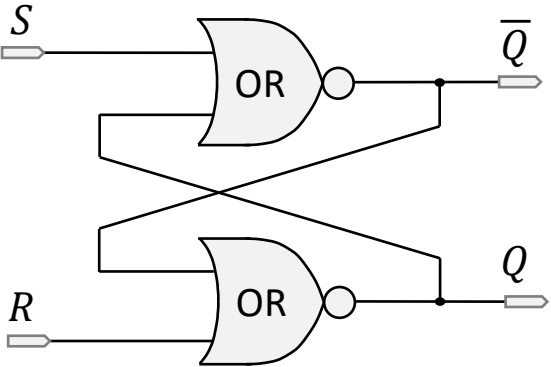
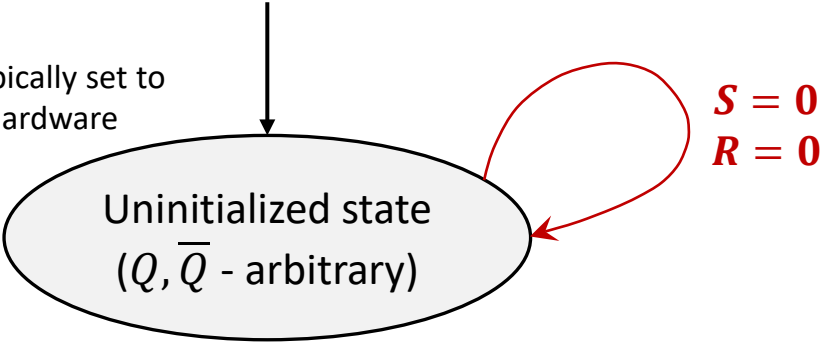
At this state, Q and $\bar{Q}$ are typically set to 0, for most of the available hardware implementations

Uninitialized state
($Q, \bar{Q}$ - arbitrary)



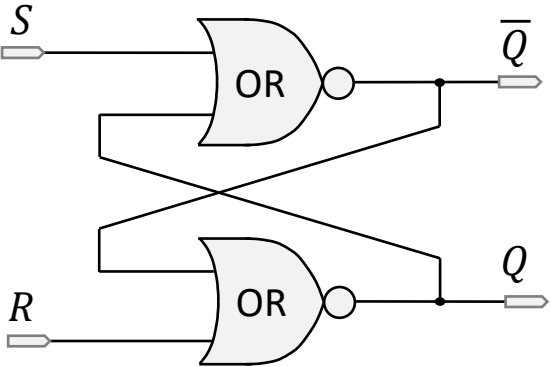
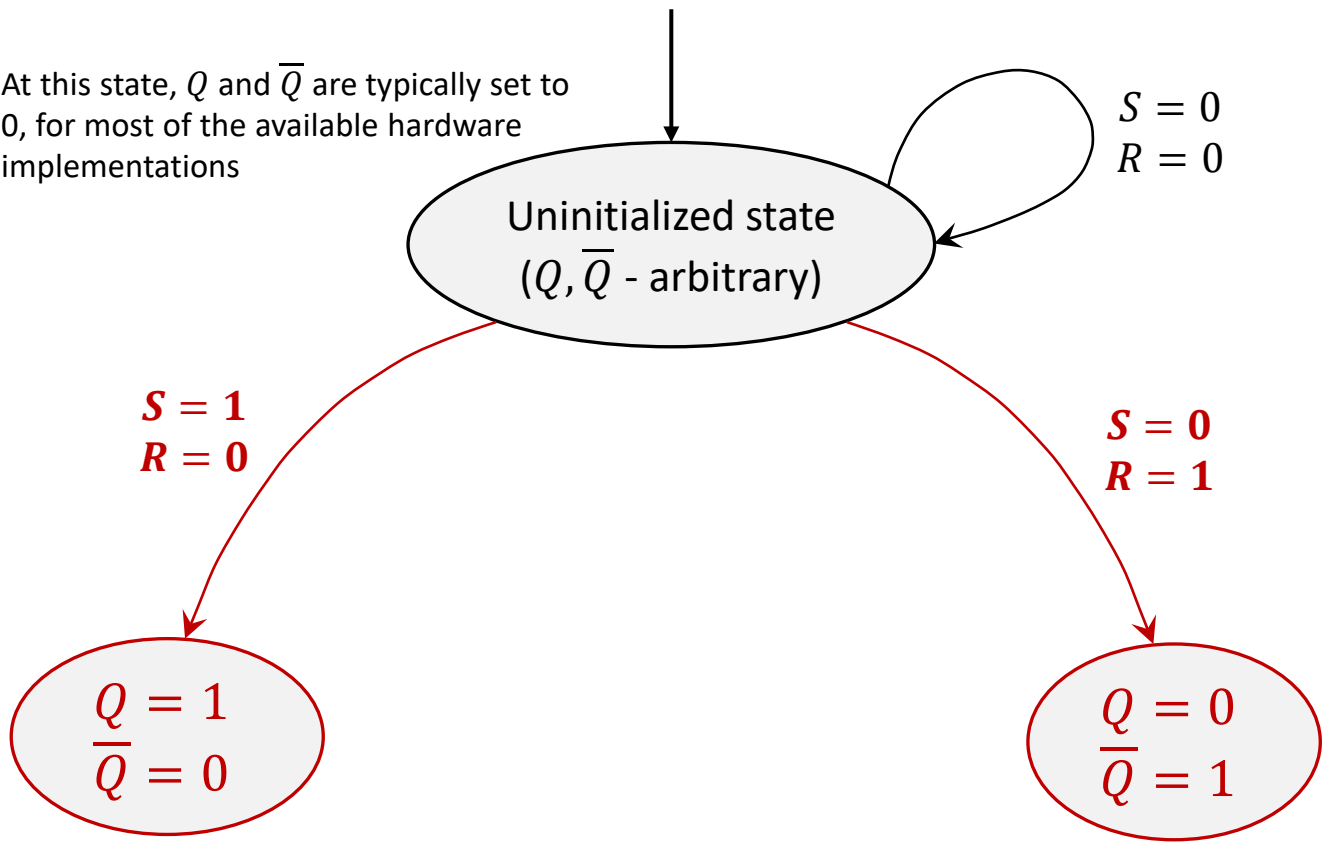
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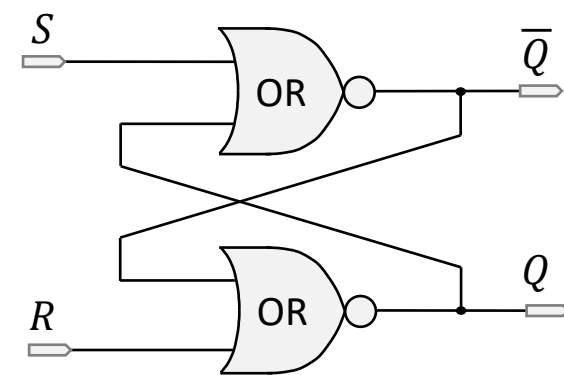
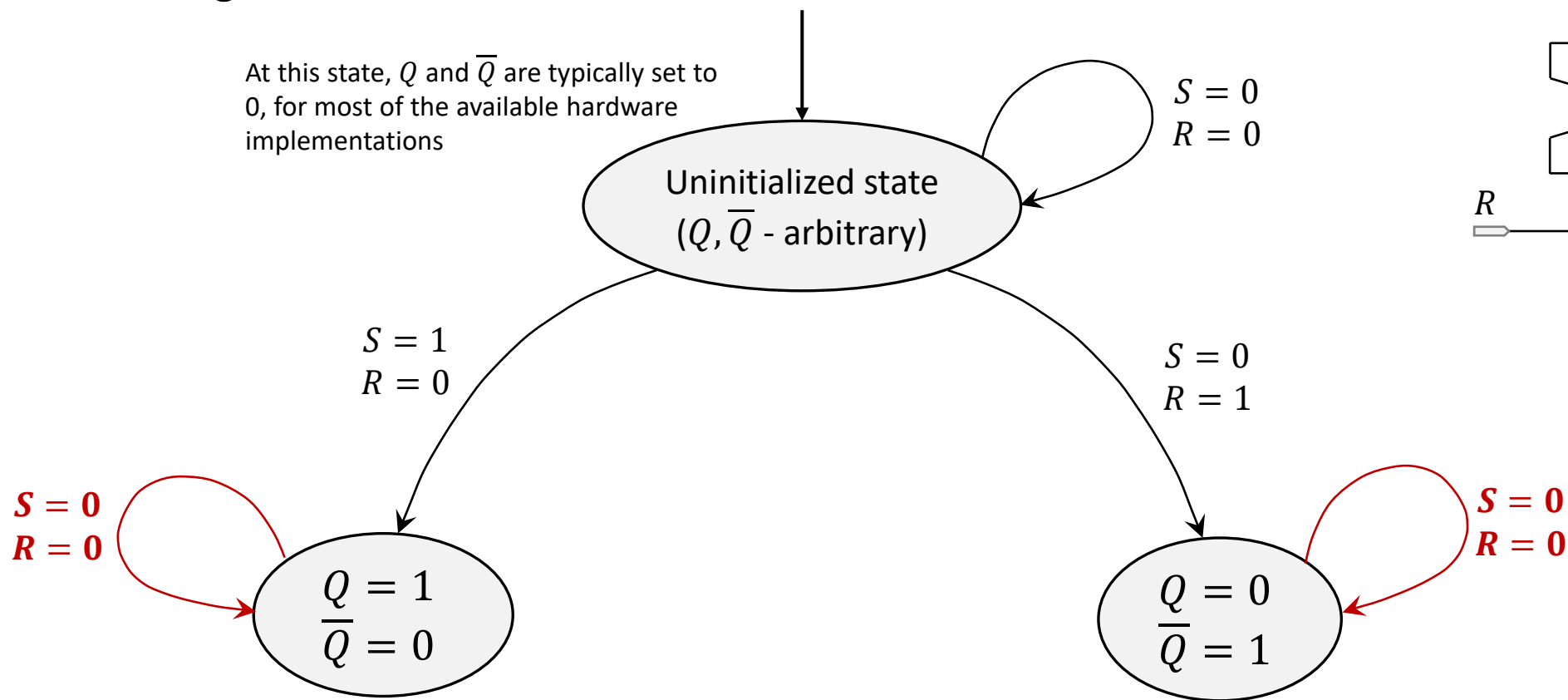


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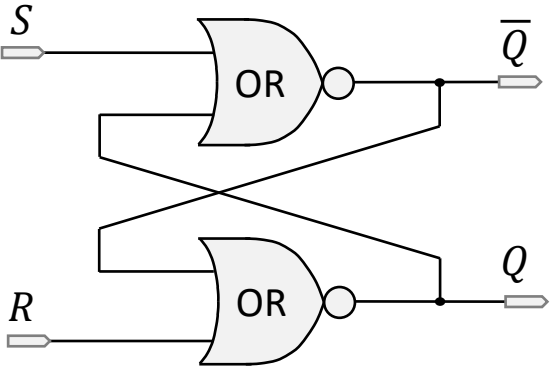
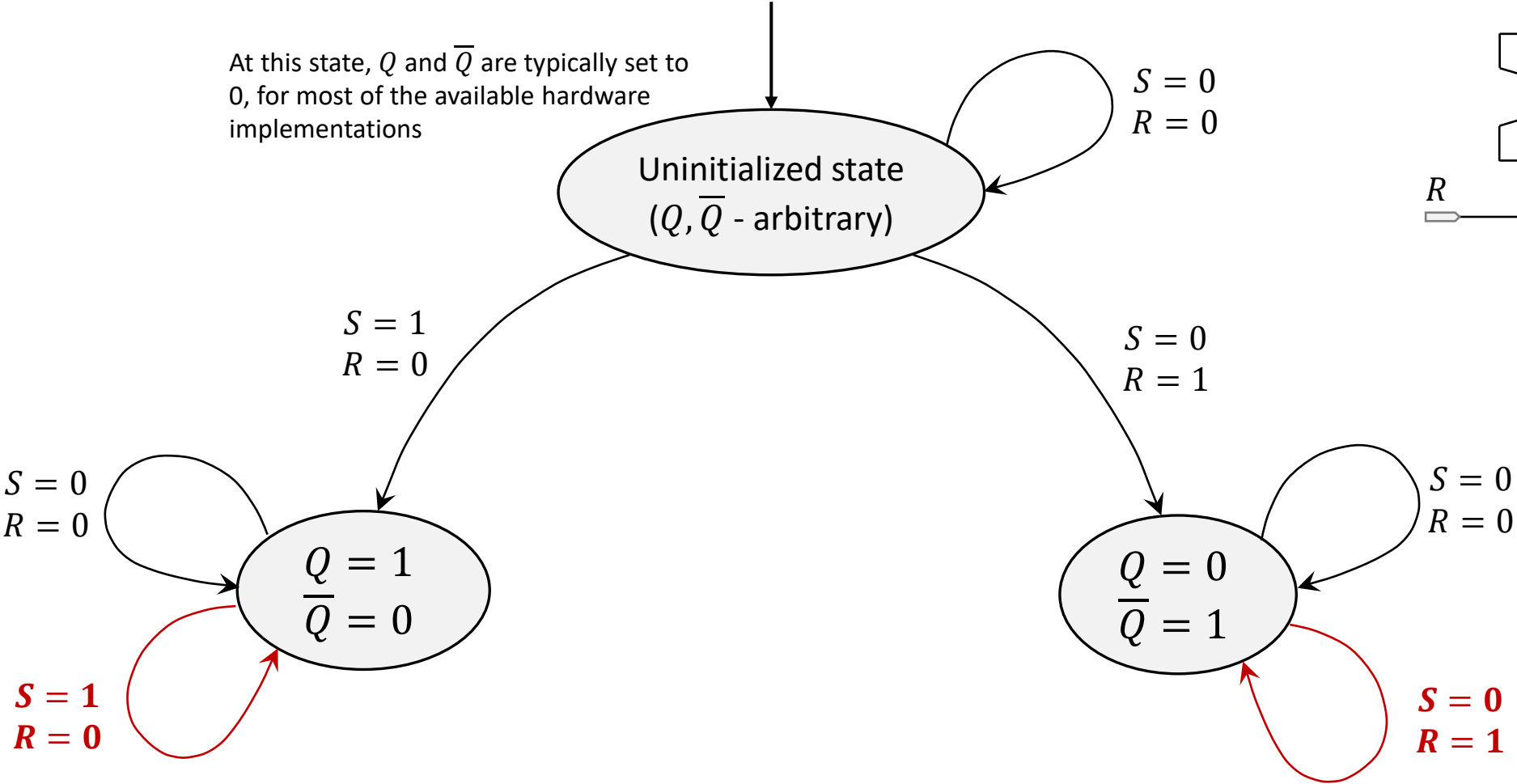
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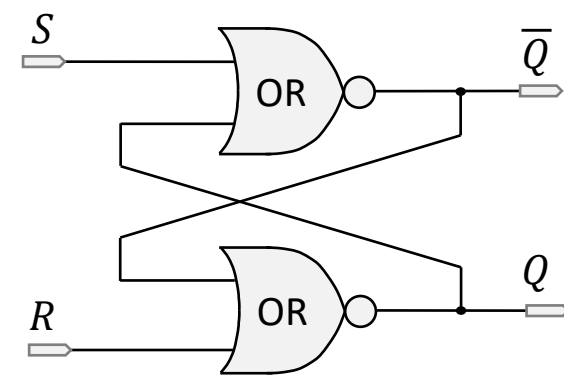
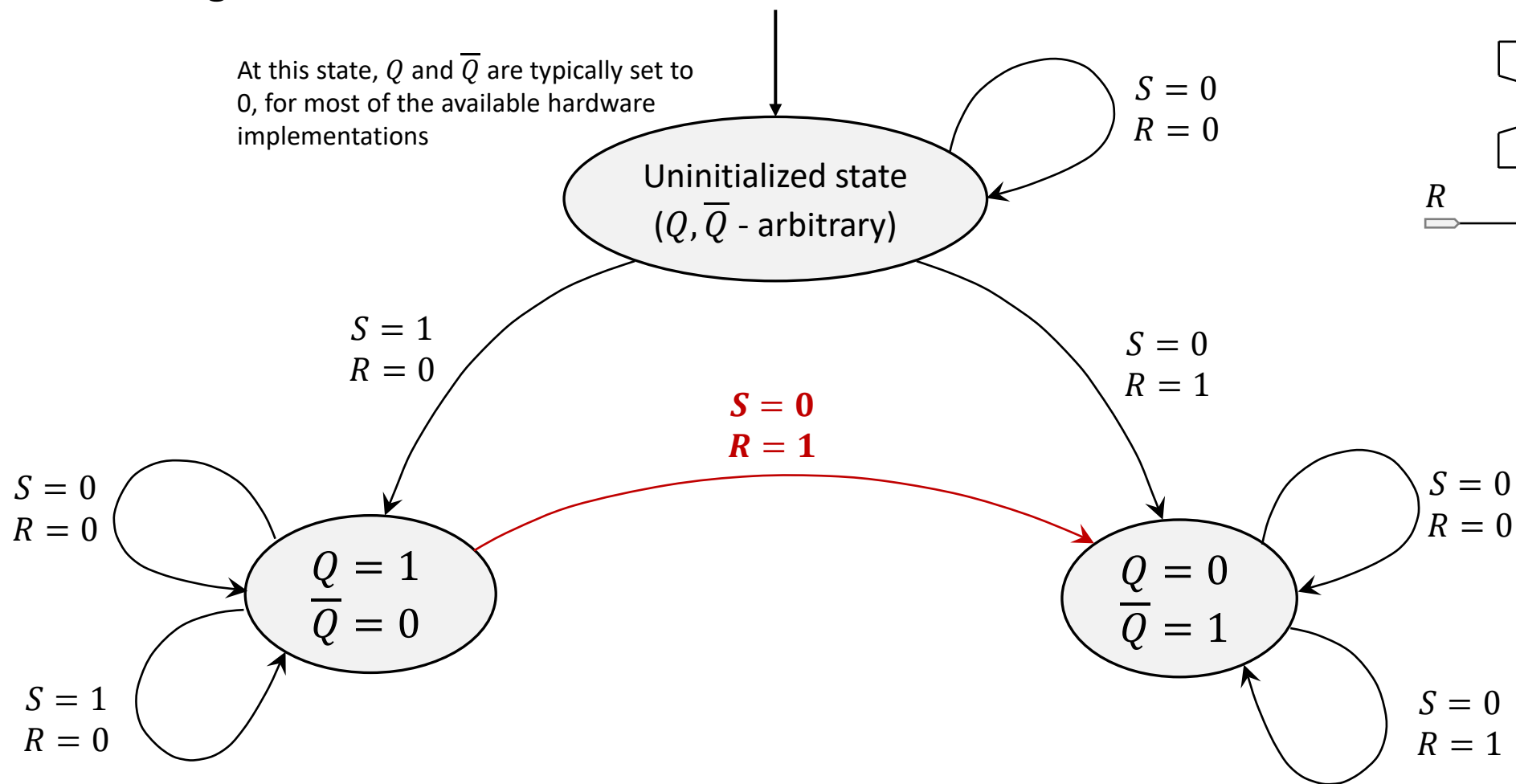
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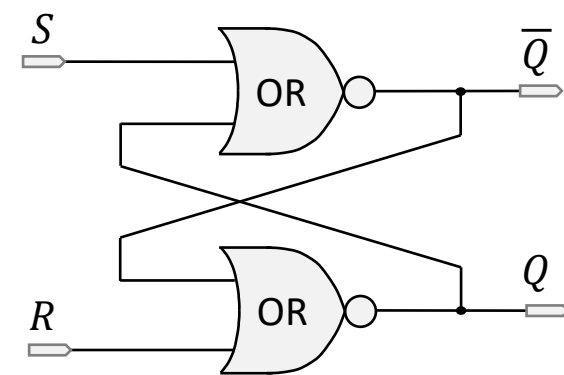
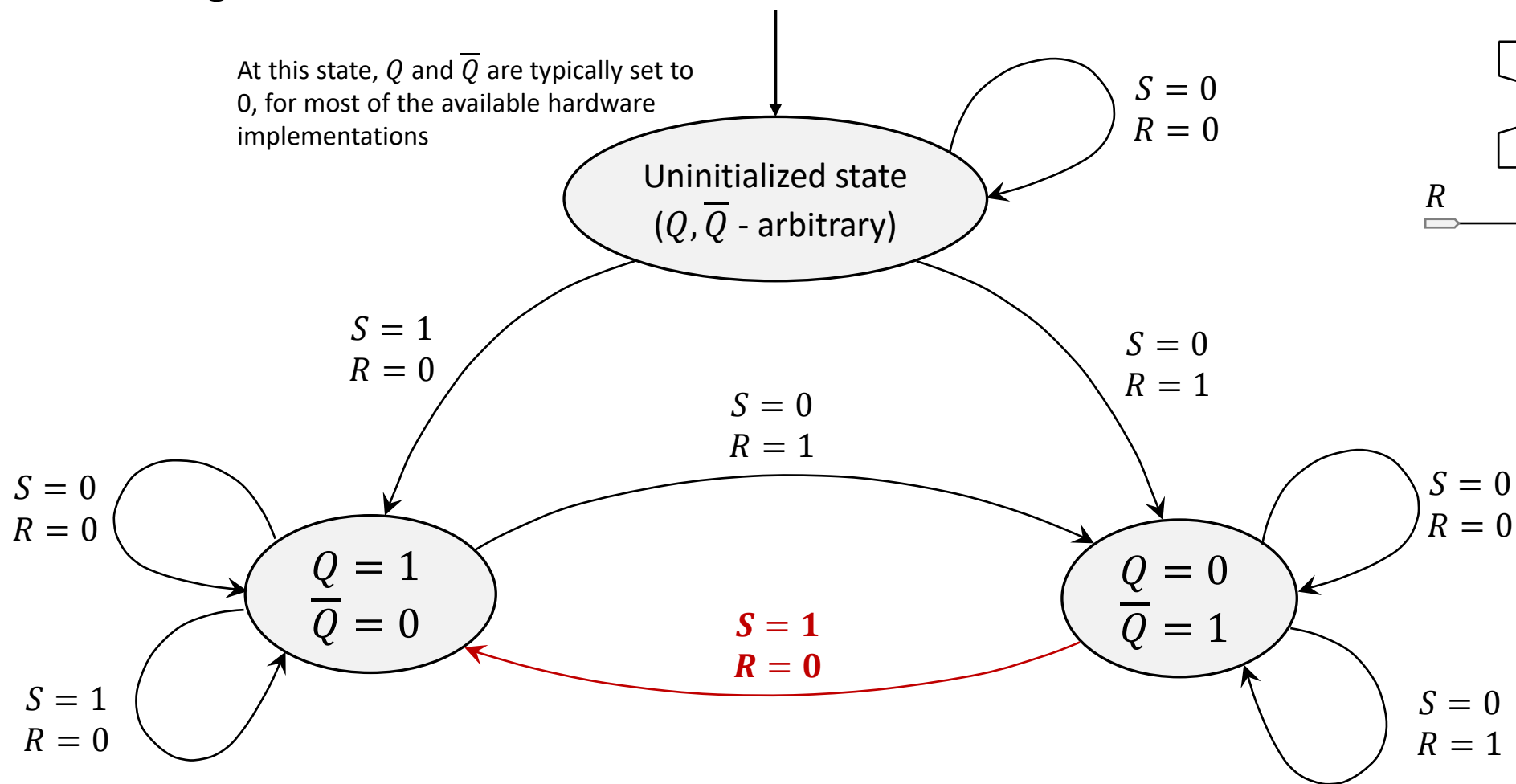
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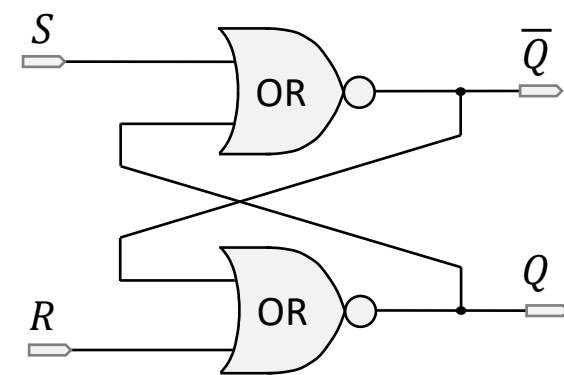
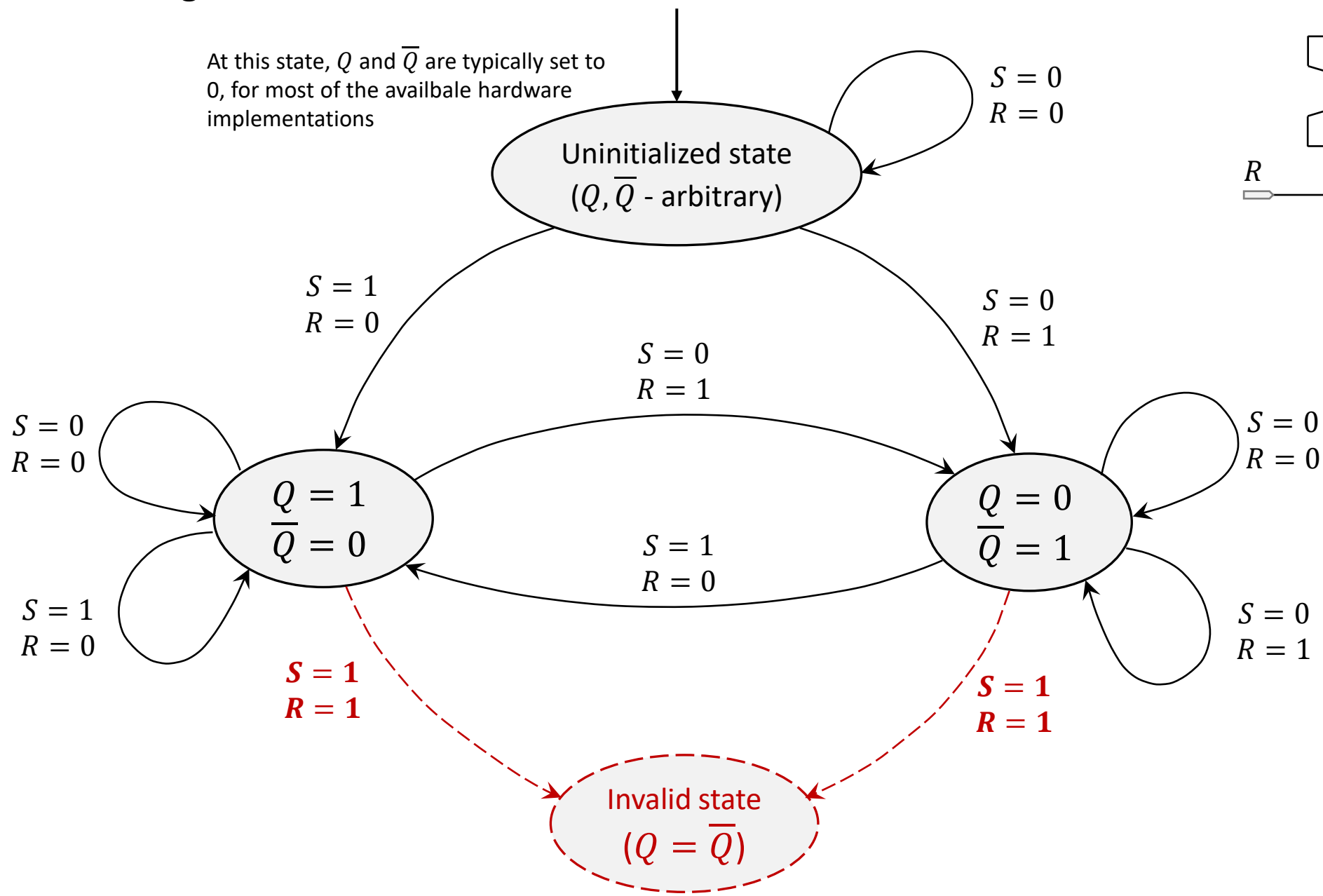
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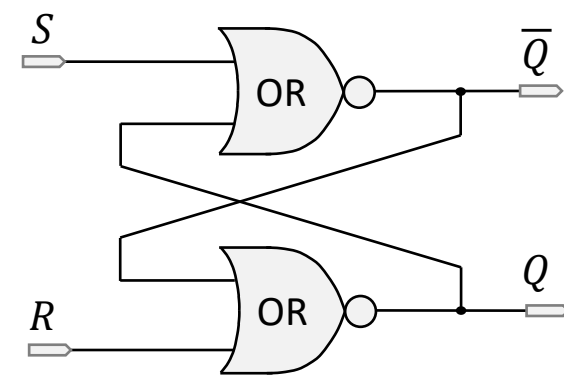
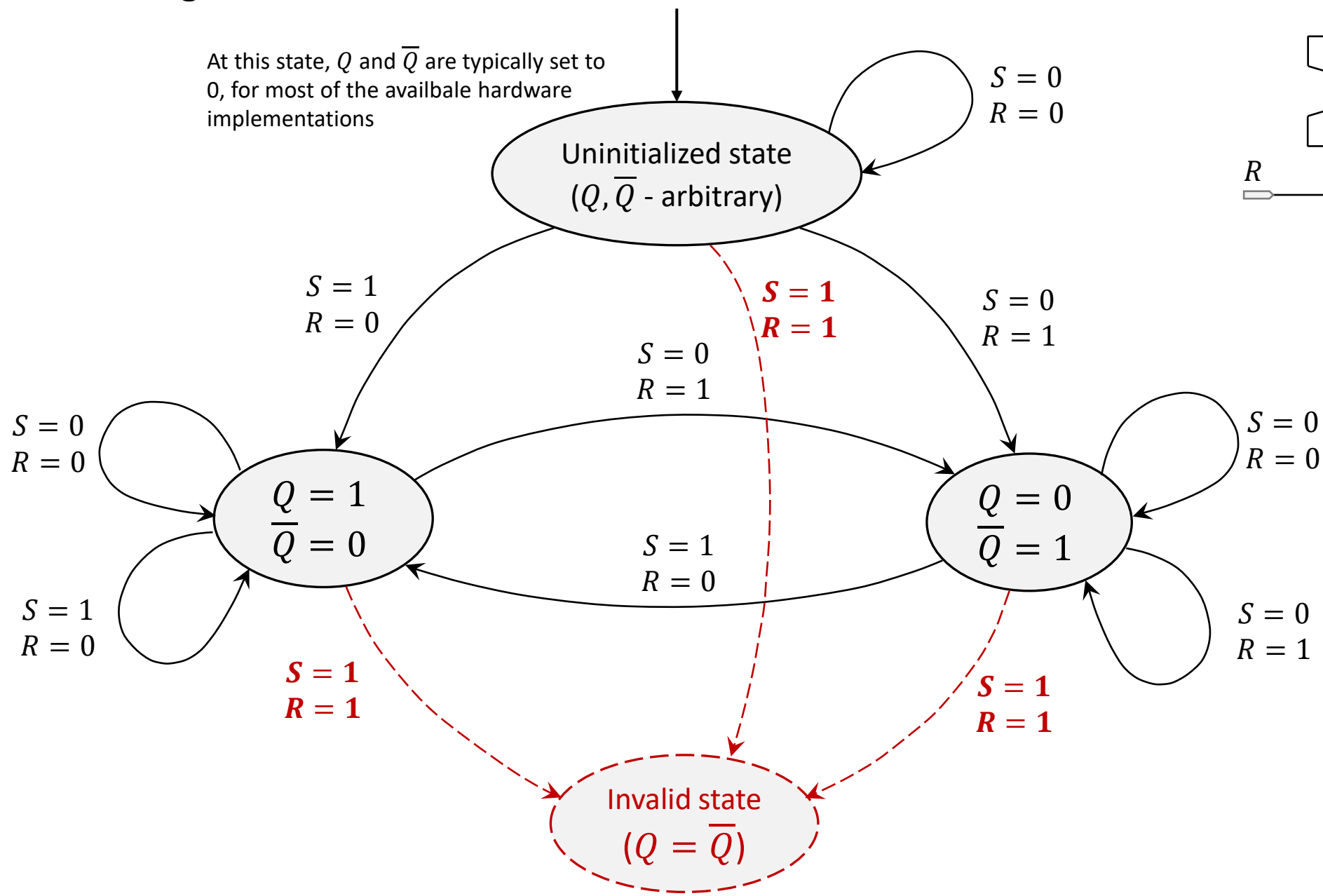
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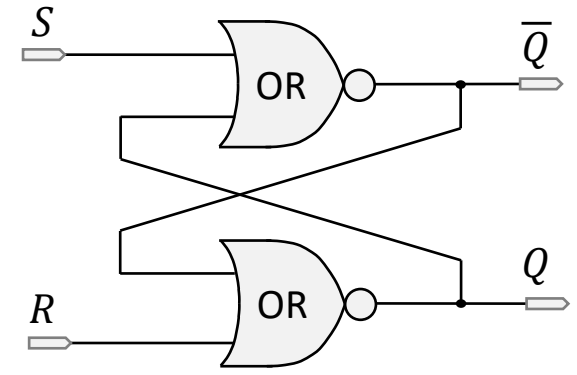
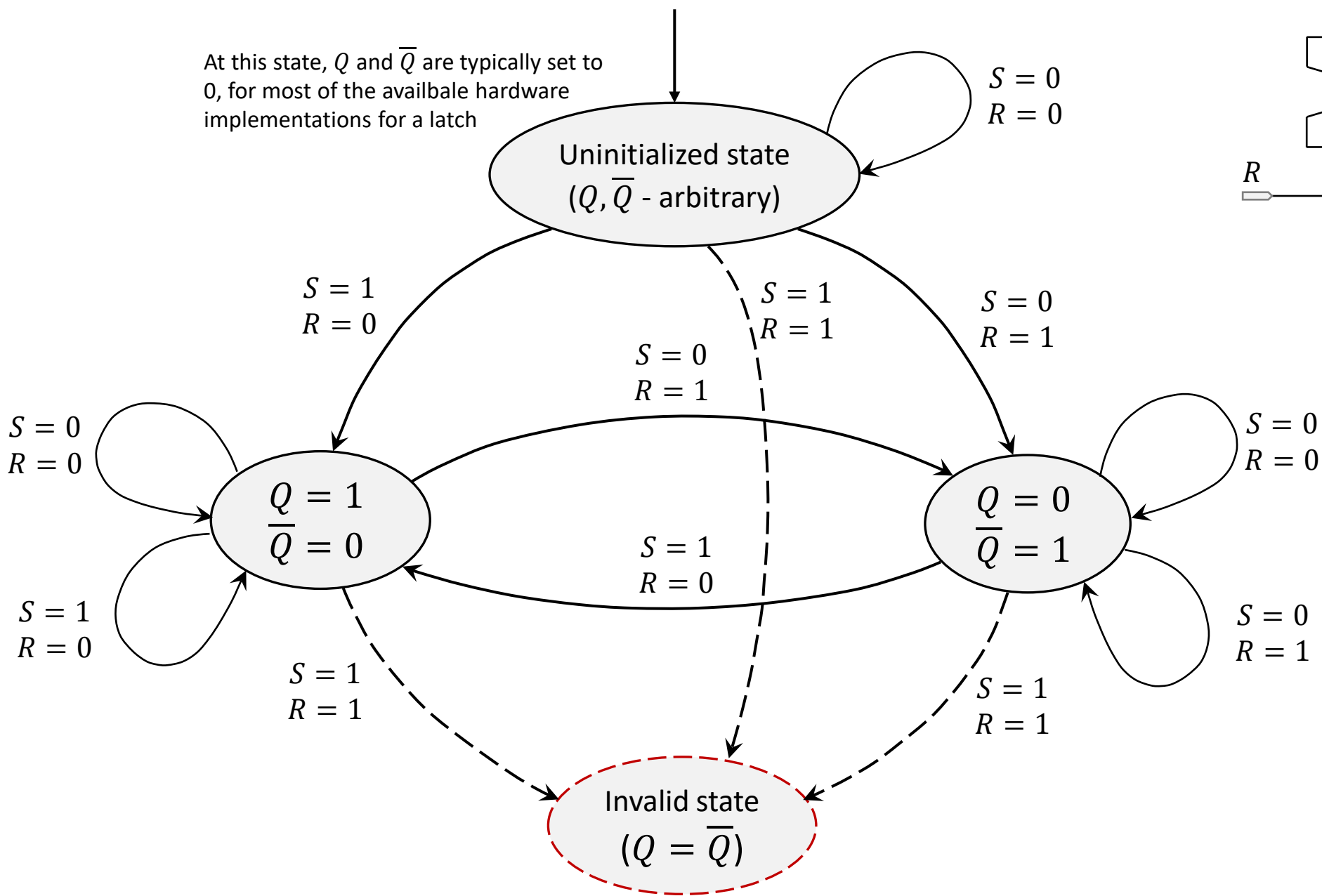
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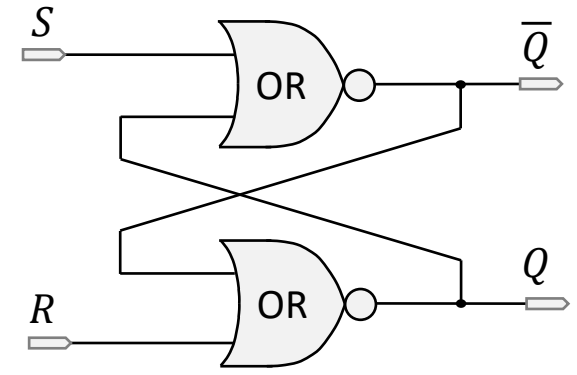
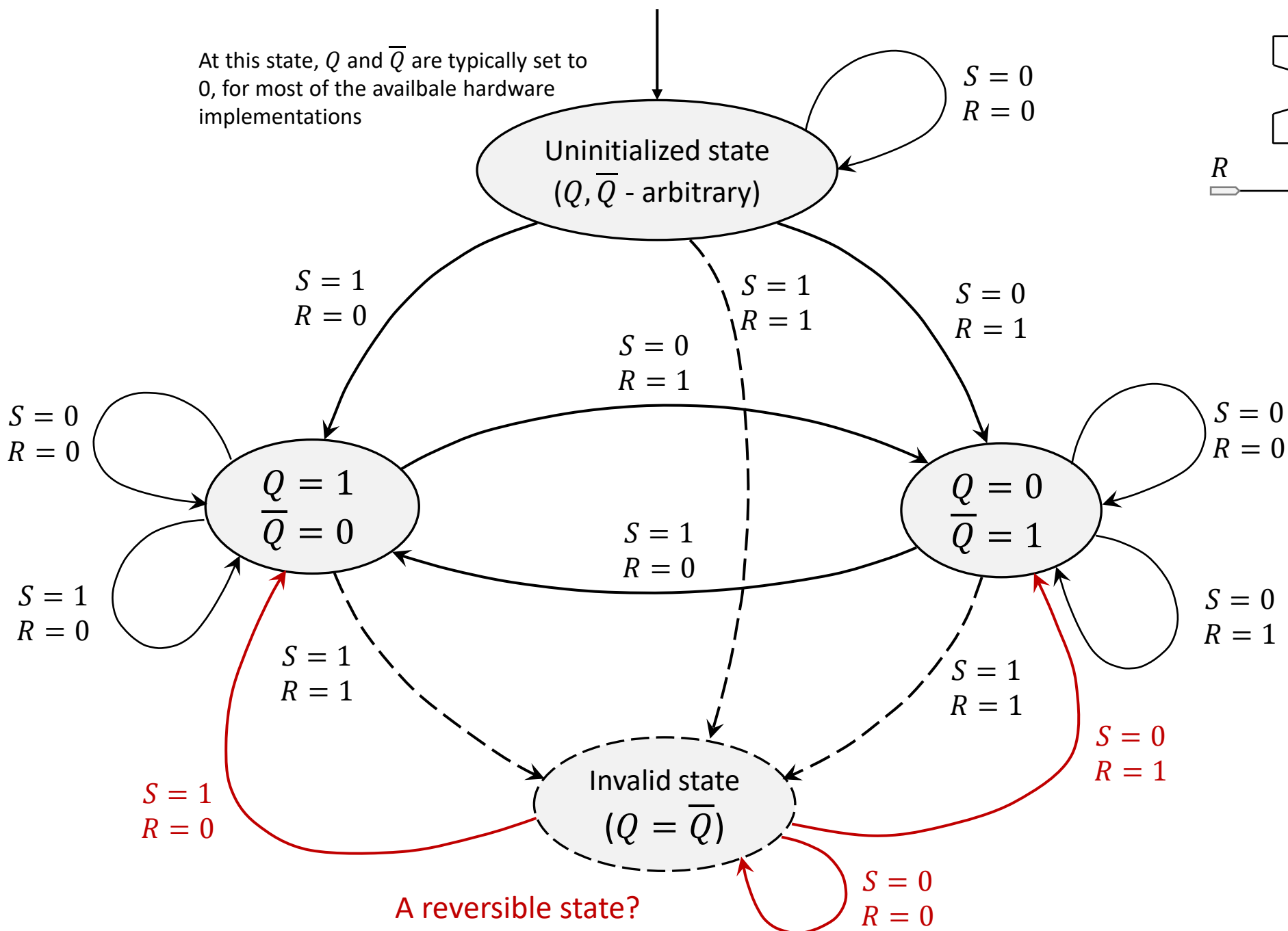


State-Transition Diagram for a Latch



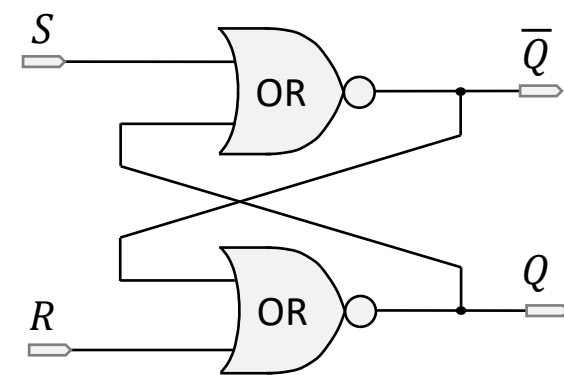
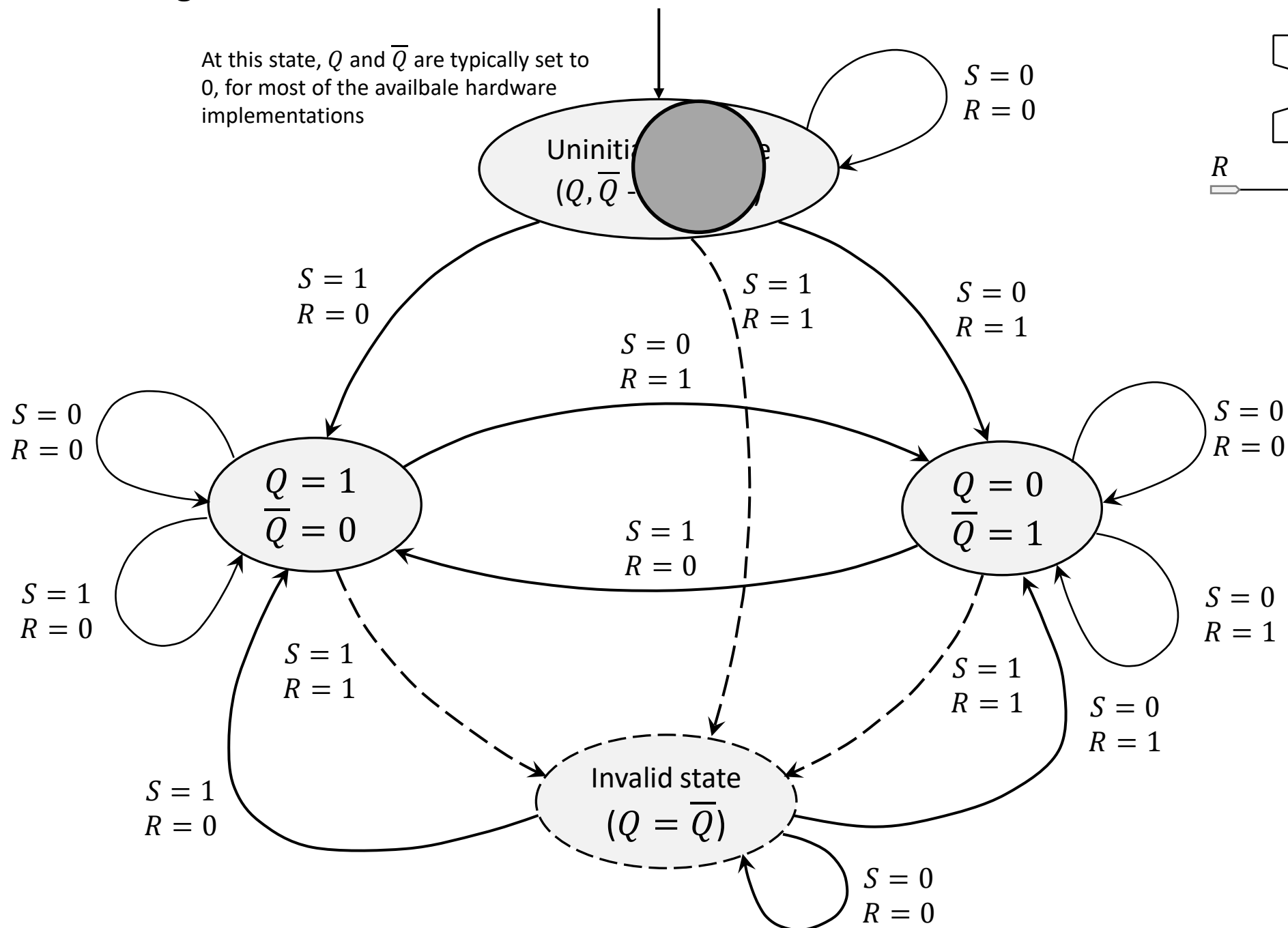
A reversible state?

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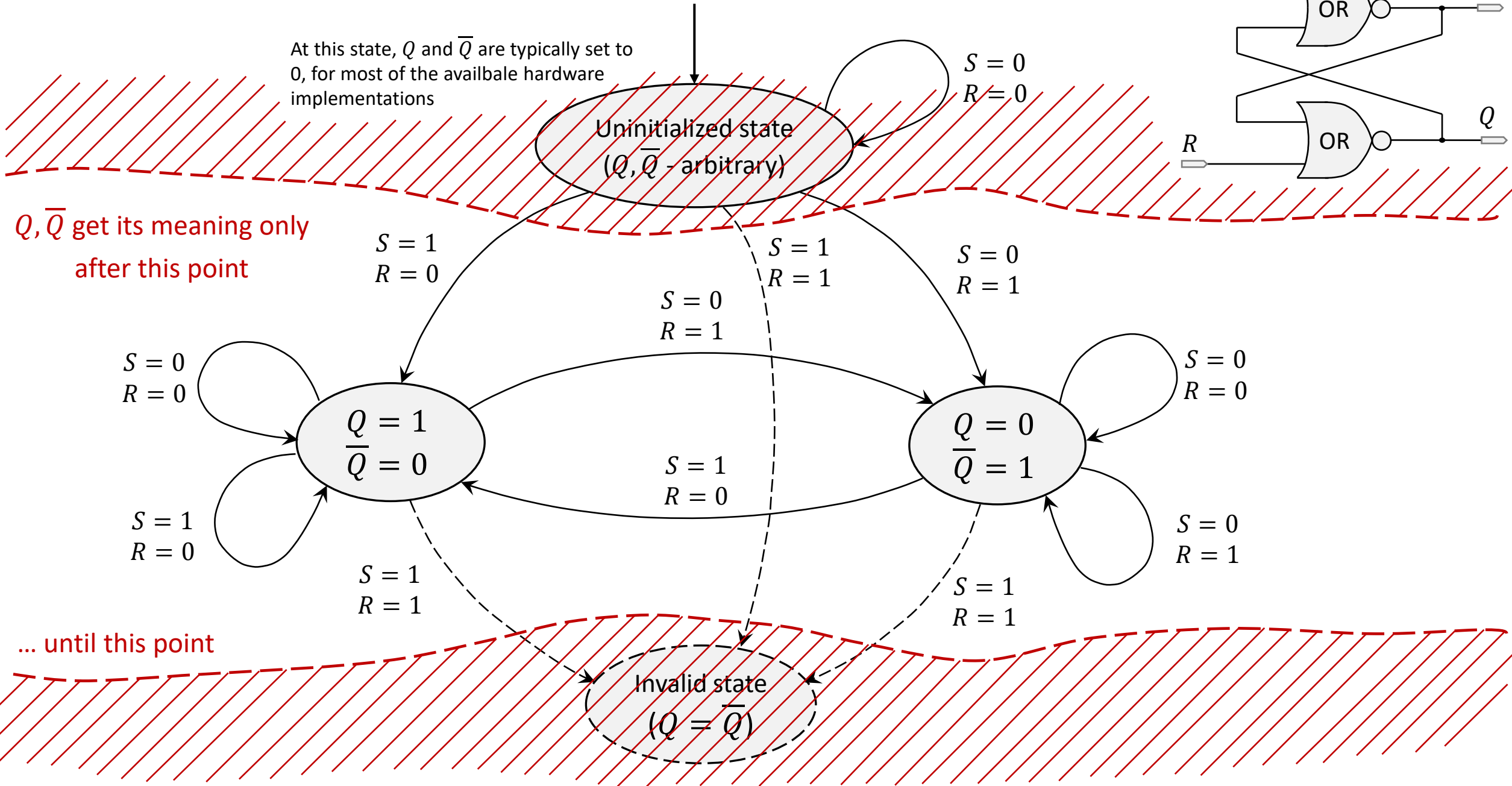
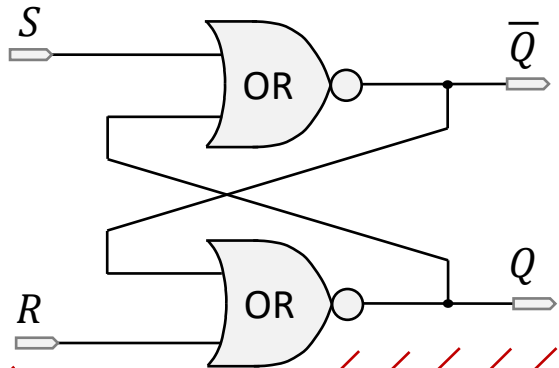


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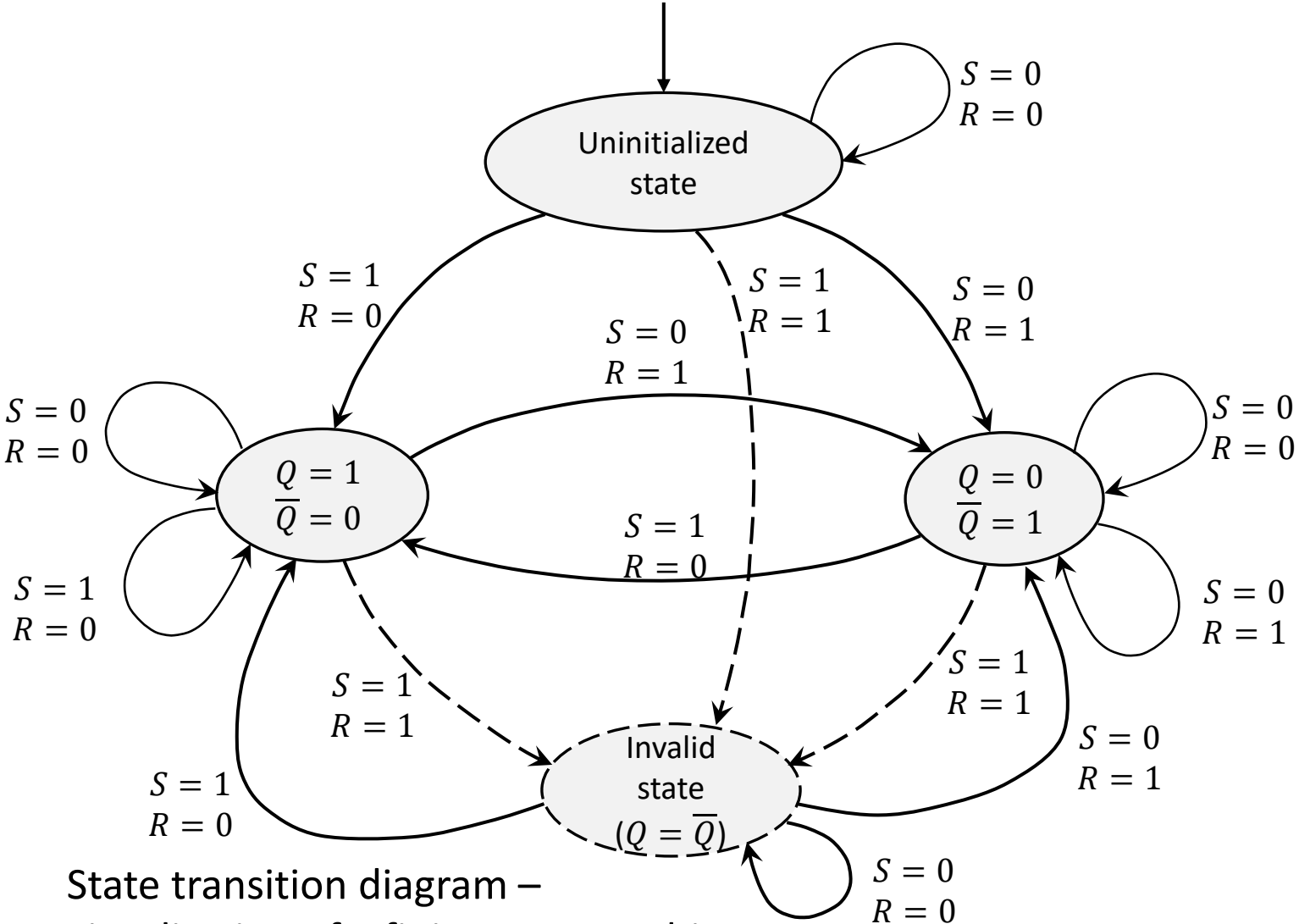


State-Transition Diagram for a Latch



Finite State Machine (FSM) (or Finite State Automaton, or simply State Machine)

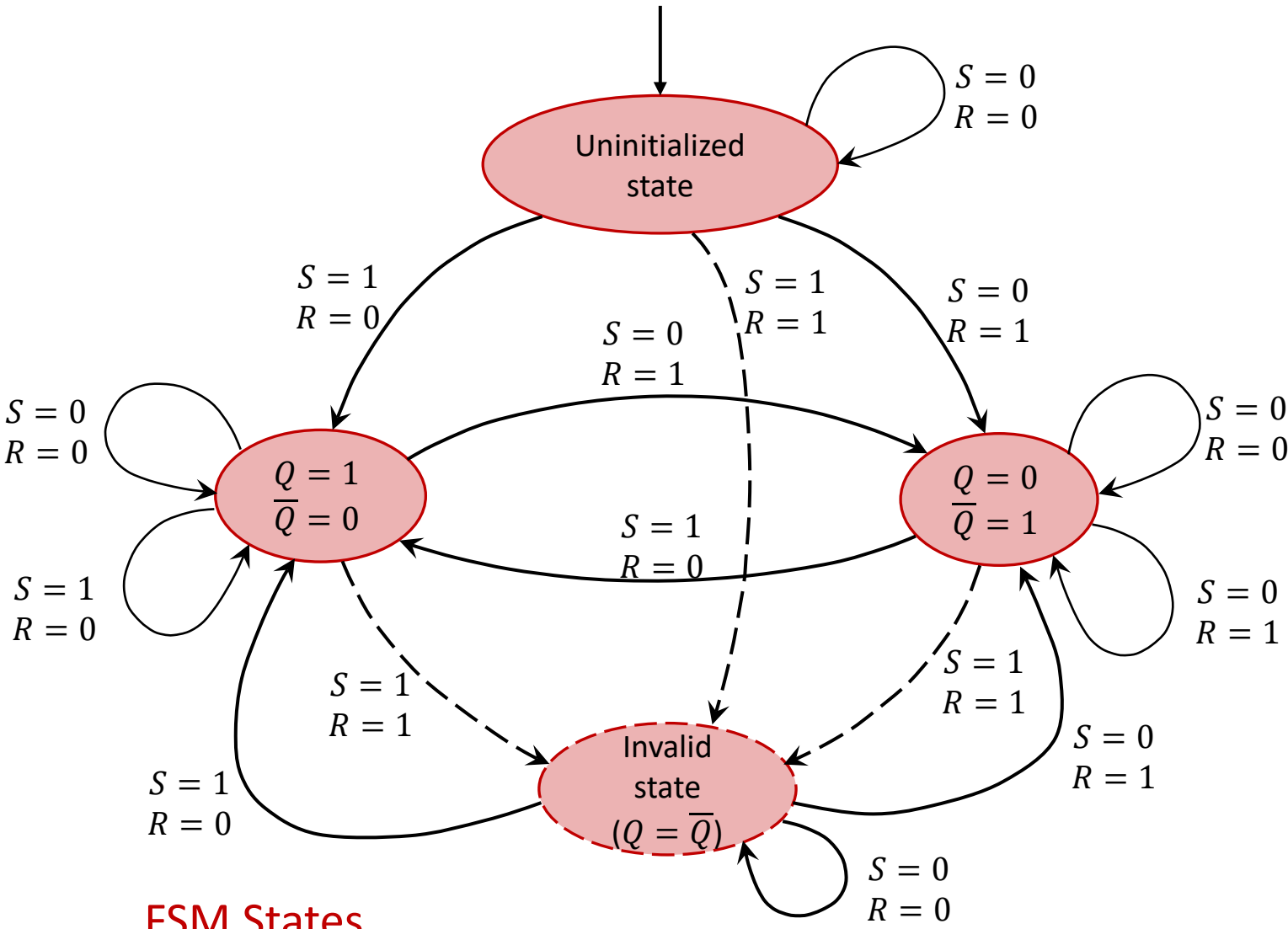
FSM - an abstract machine



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FSM - an abstract machine, defined as follows:

a) It can be in exactly one of a finite number of states at any given time;

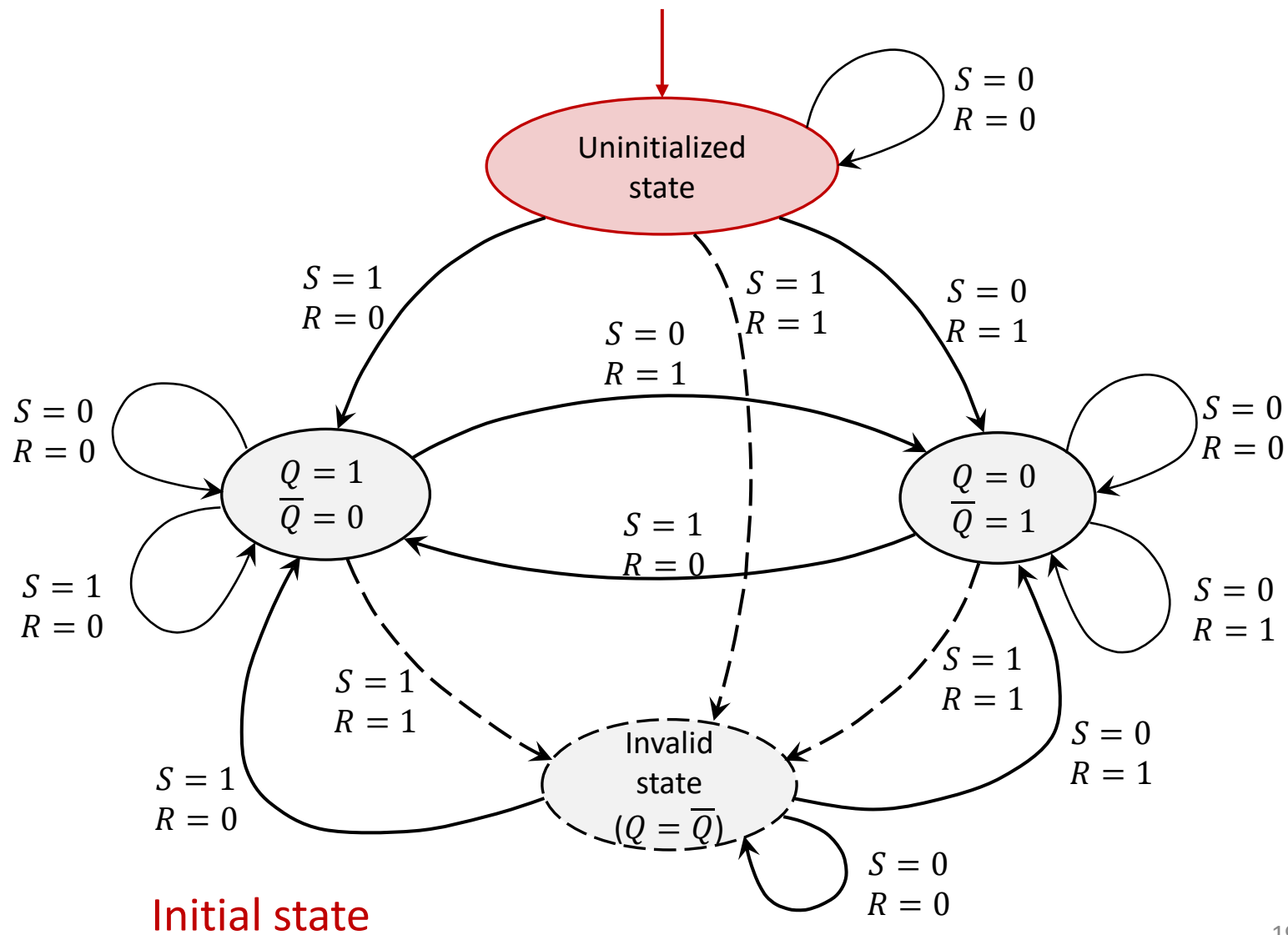


FSM States

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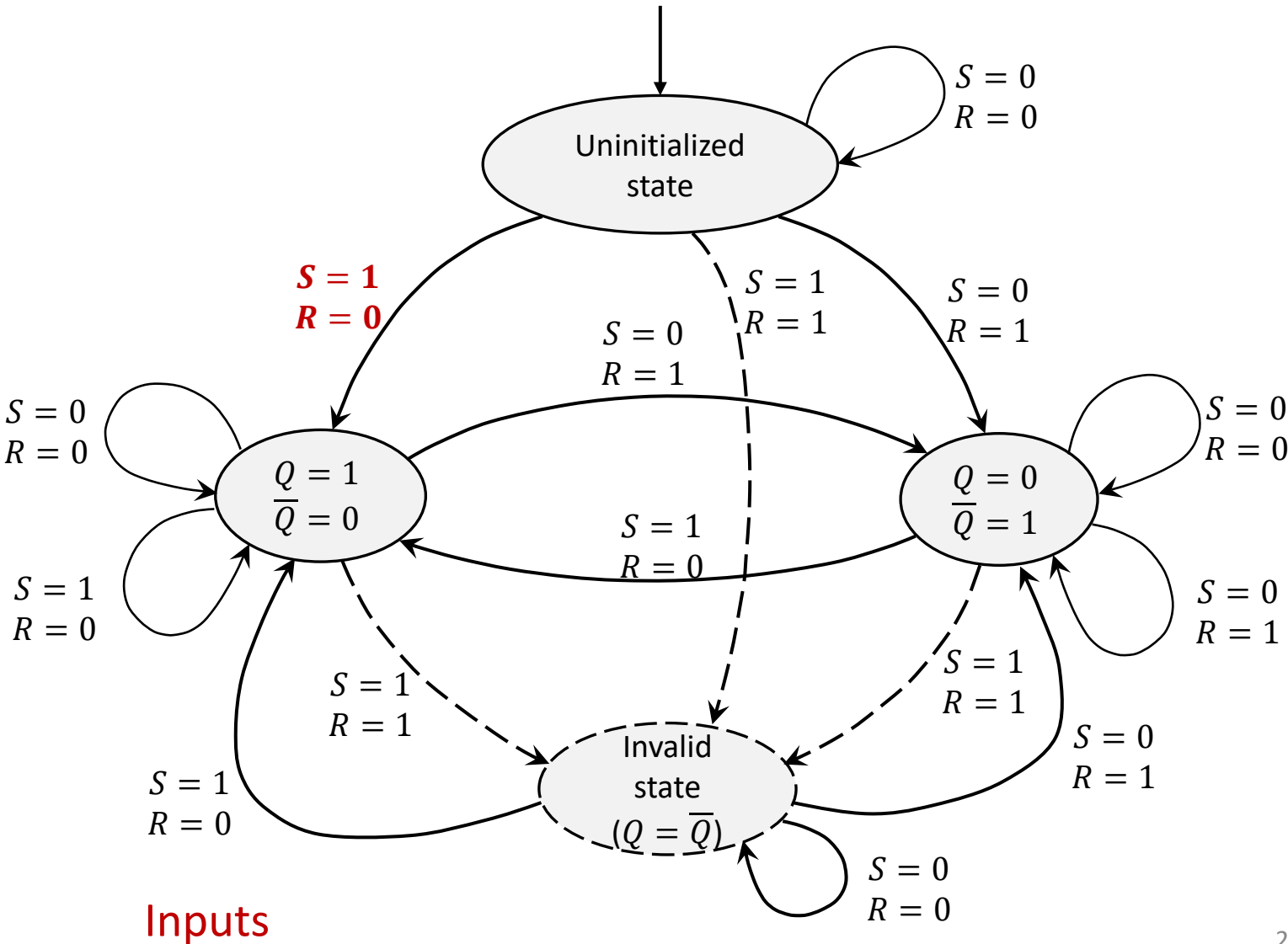
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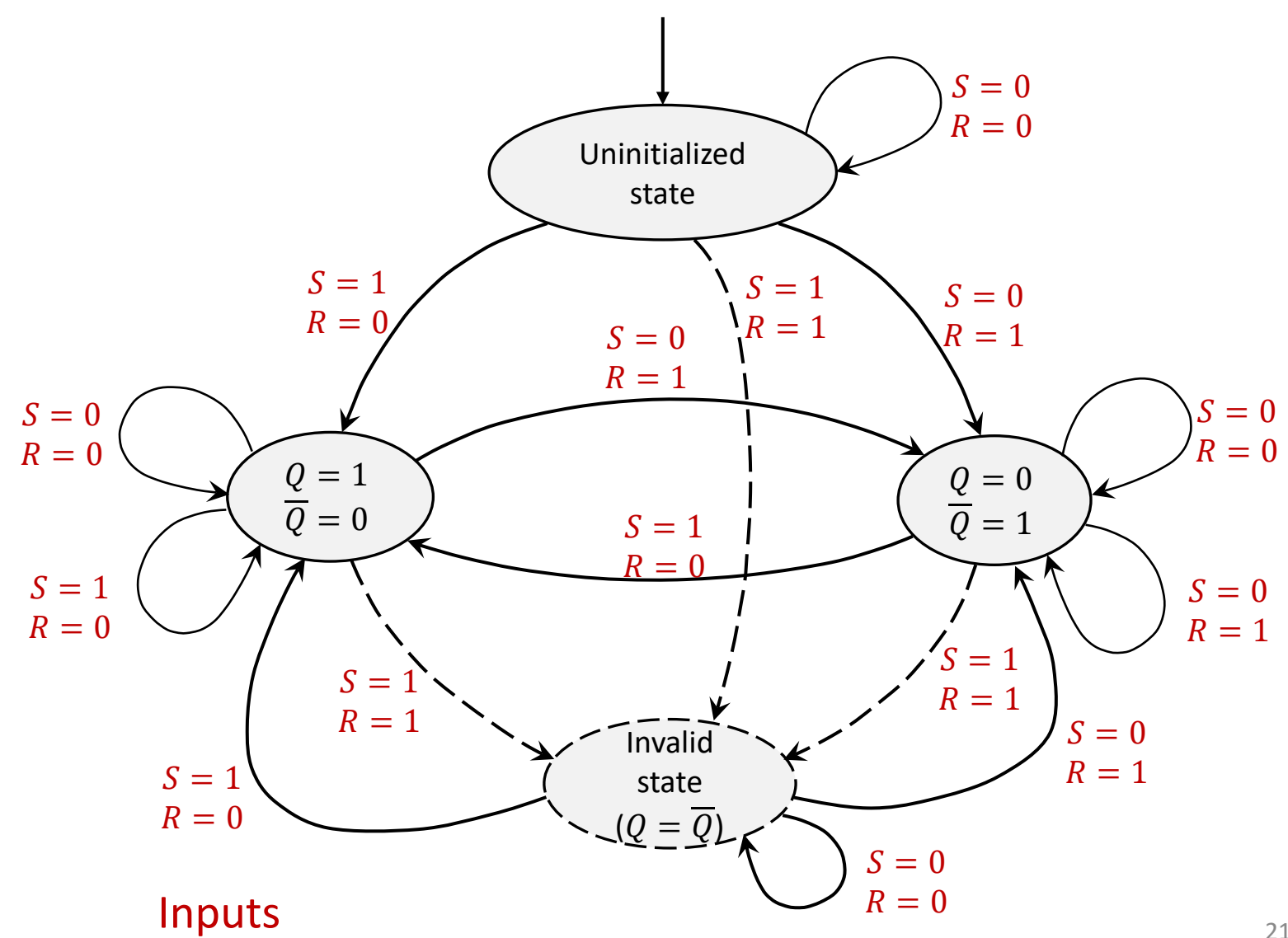
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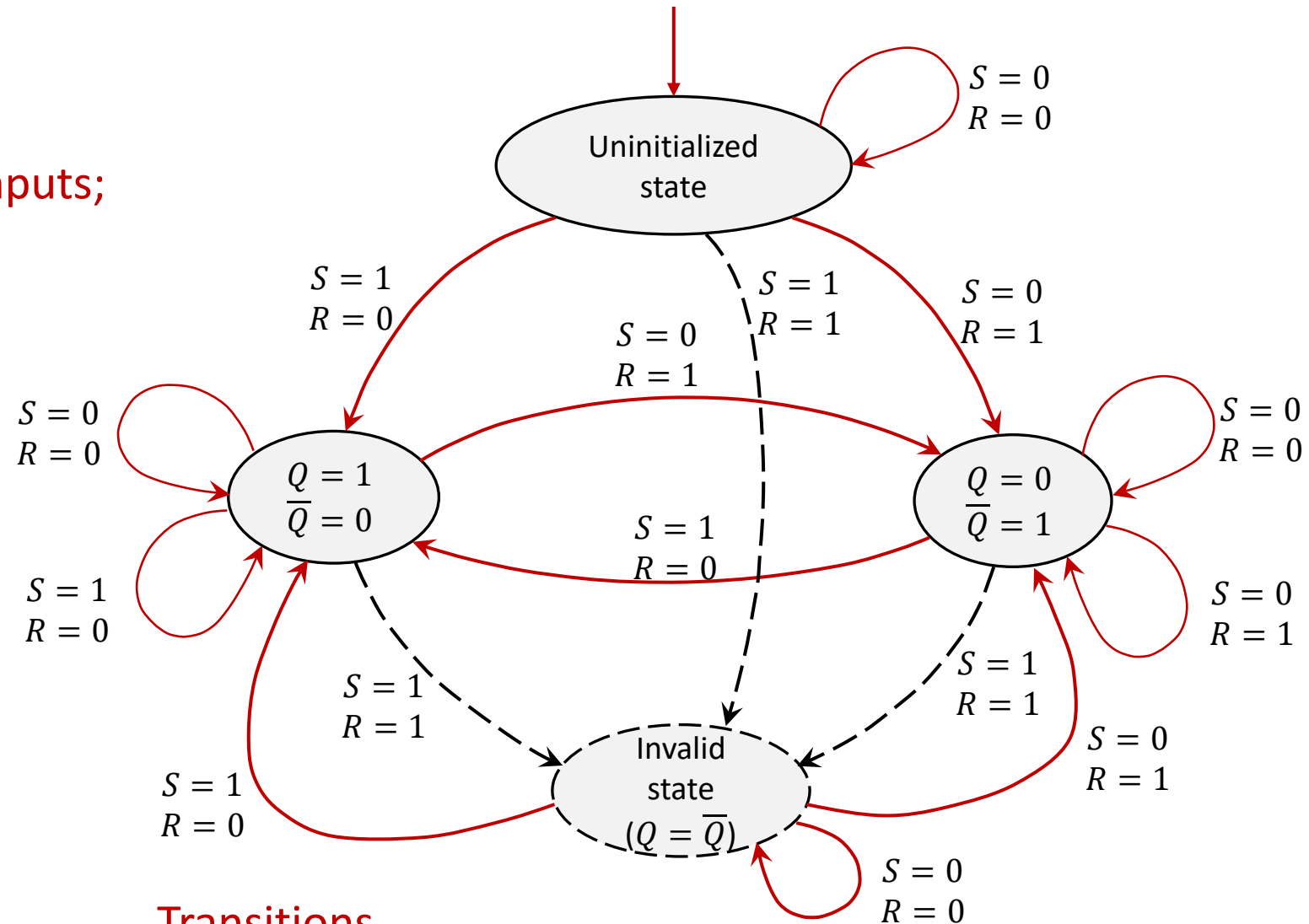
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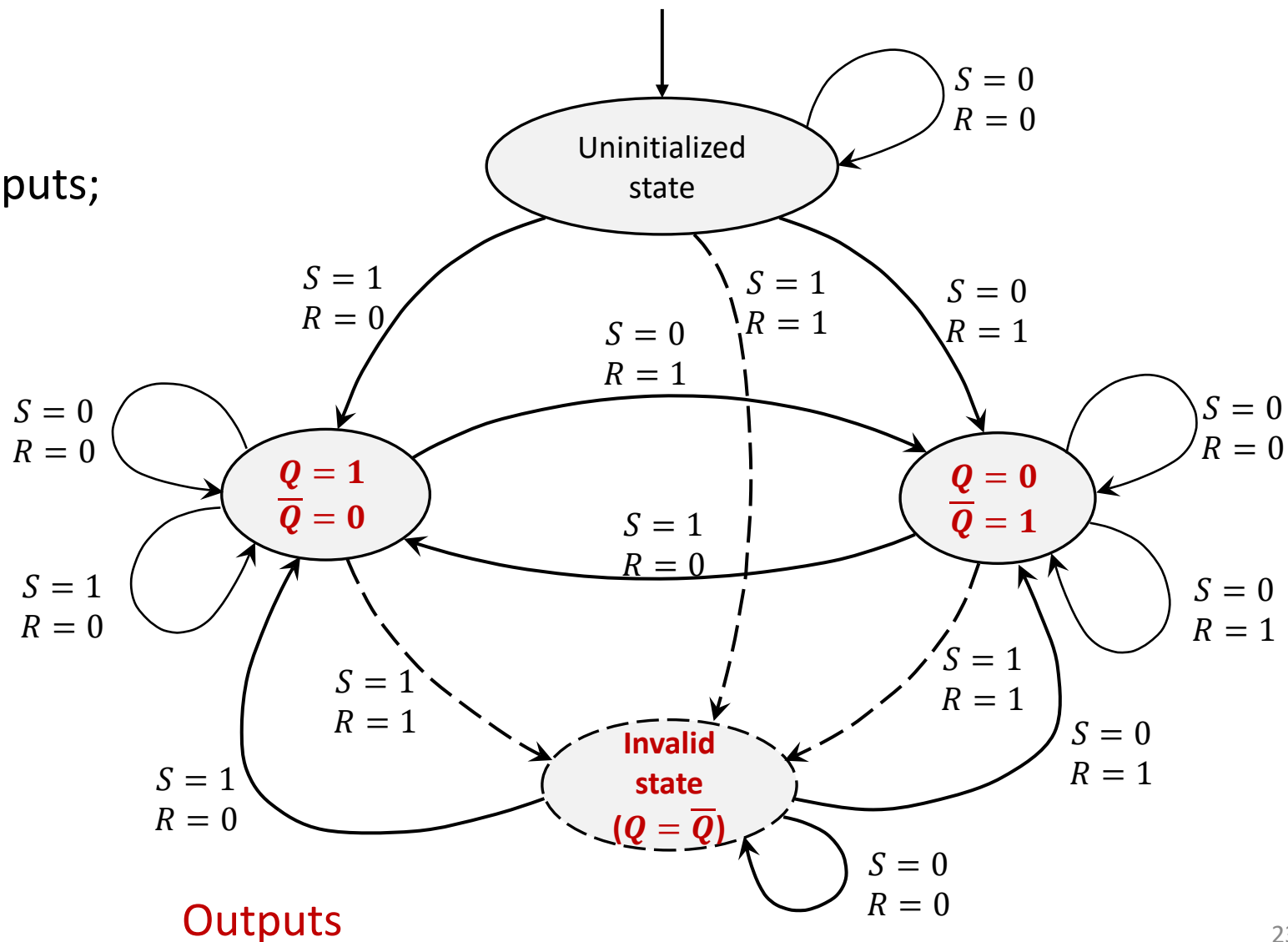
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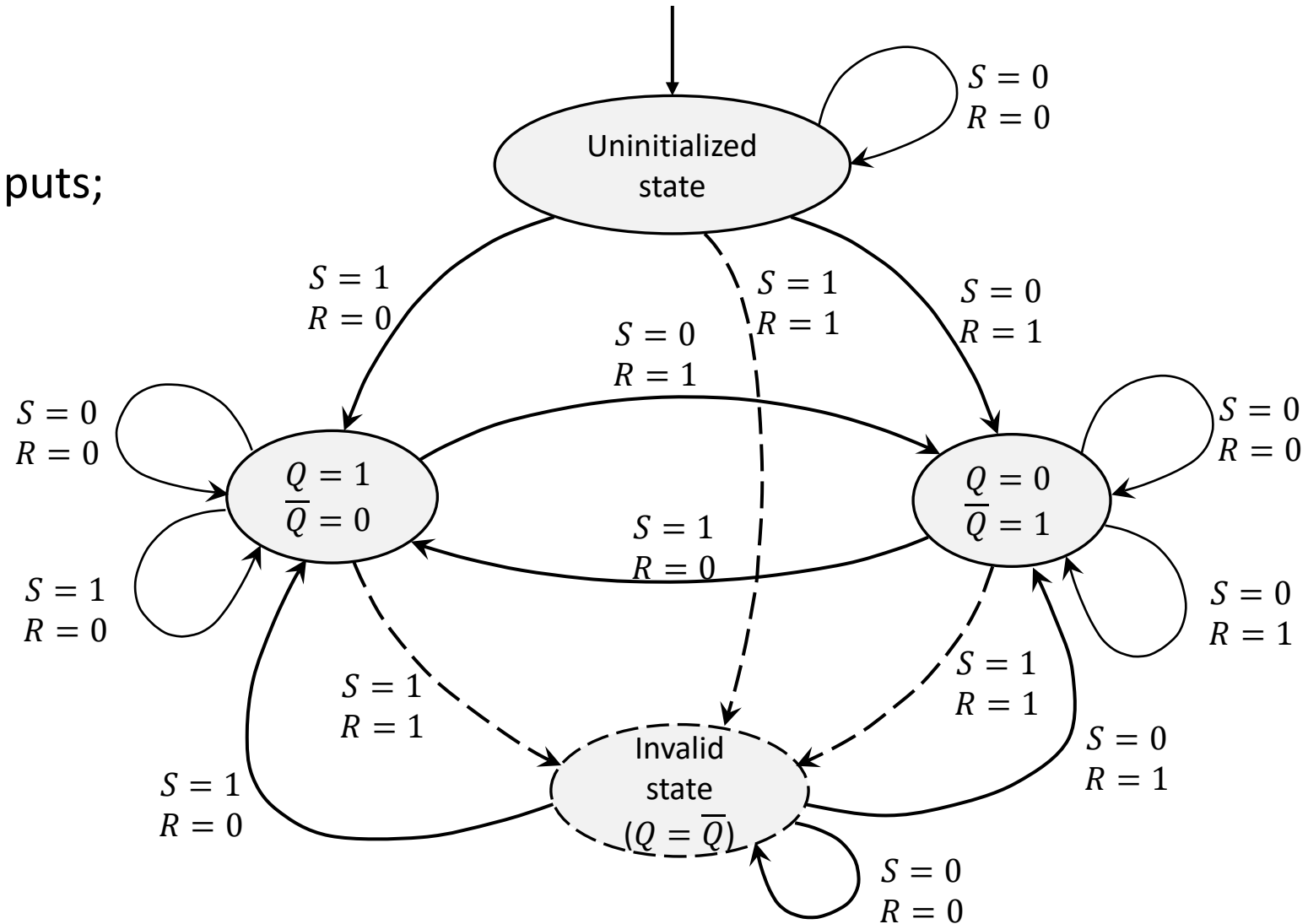
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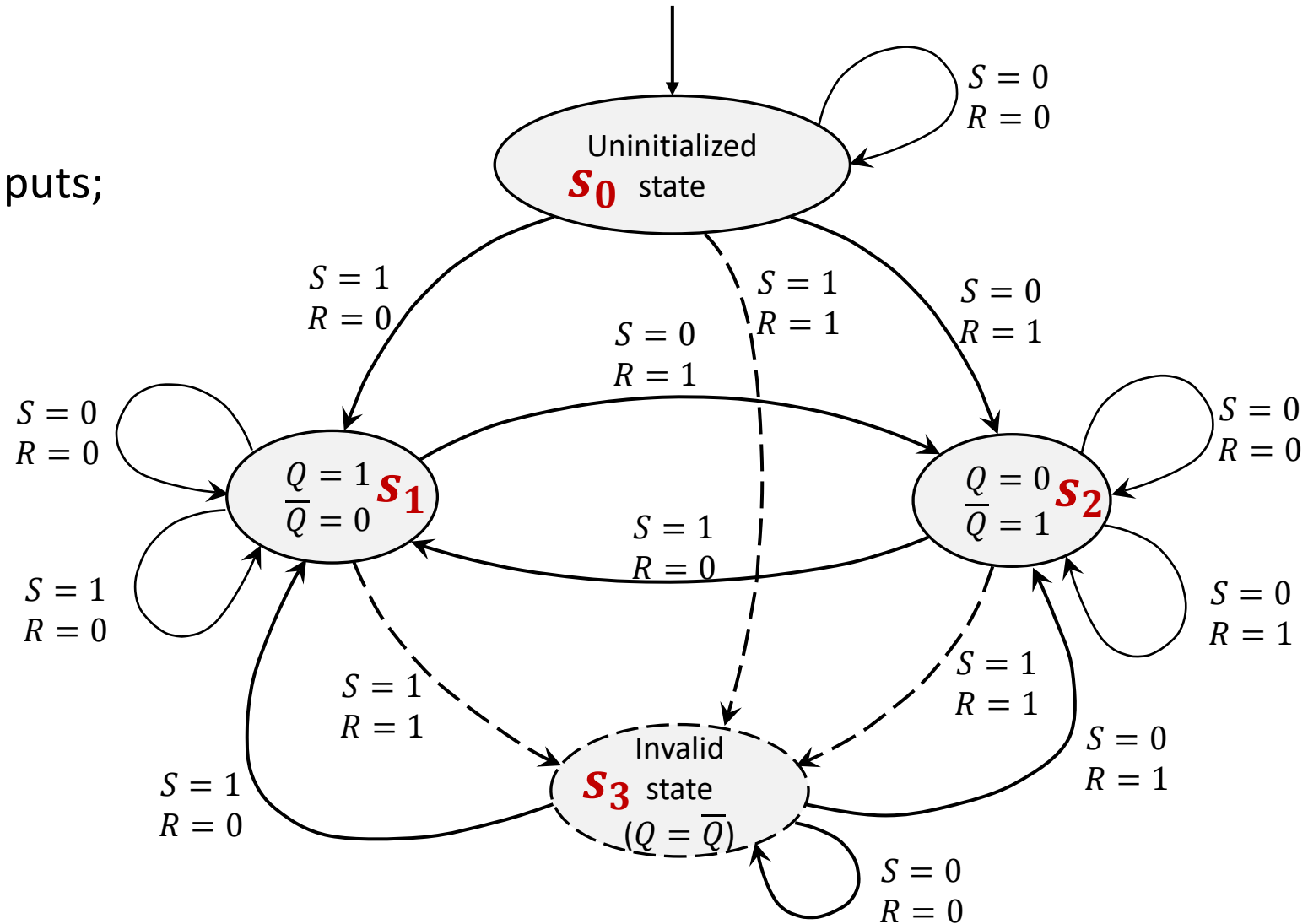
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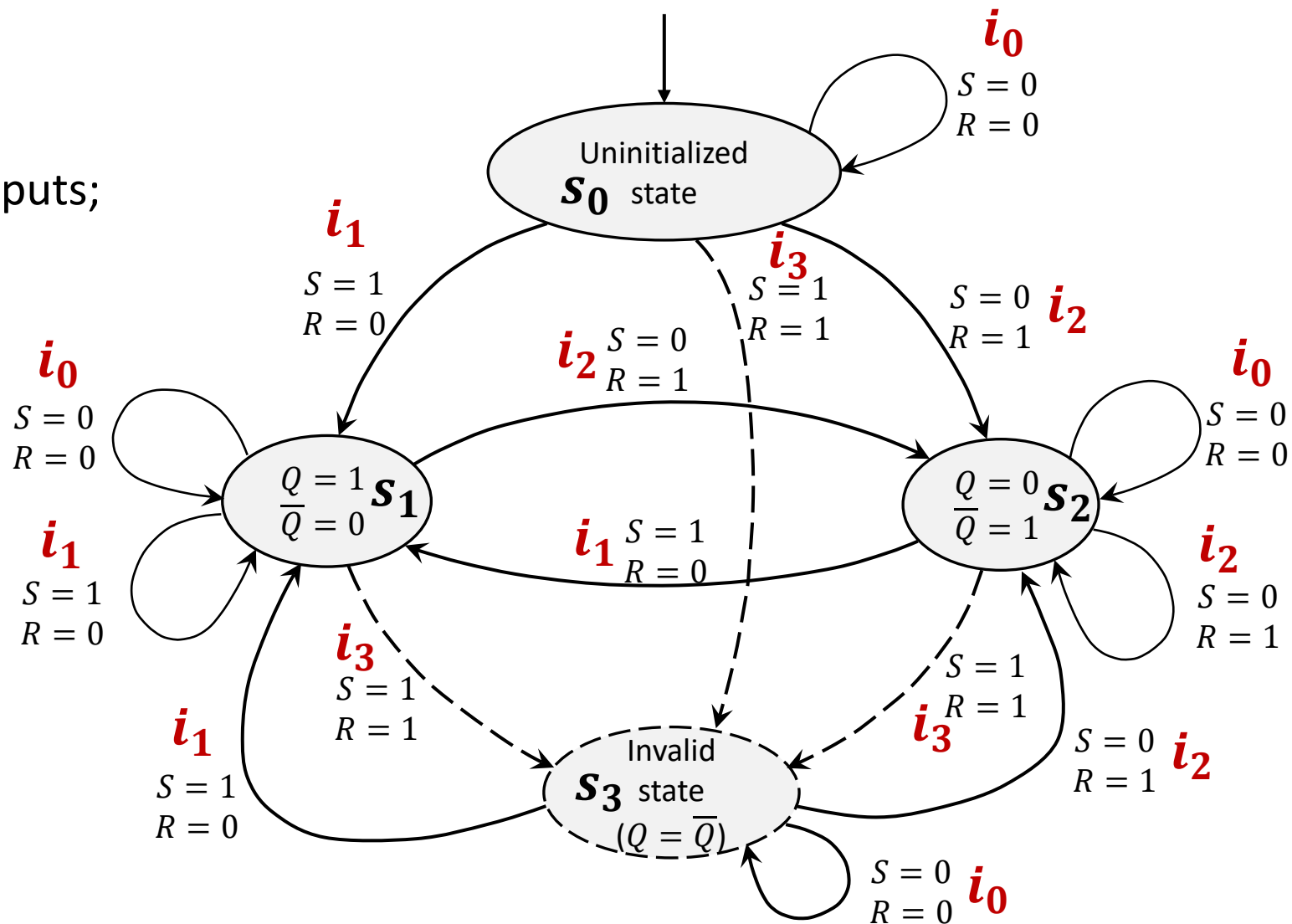
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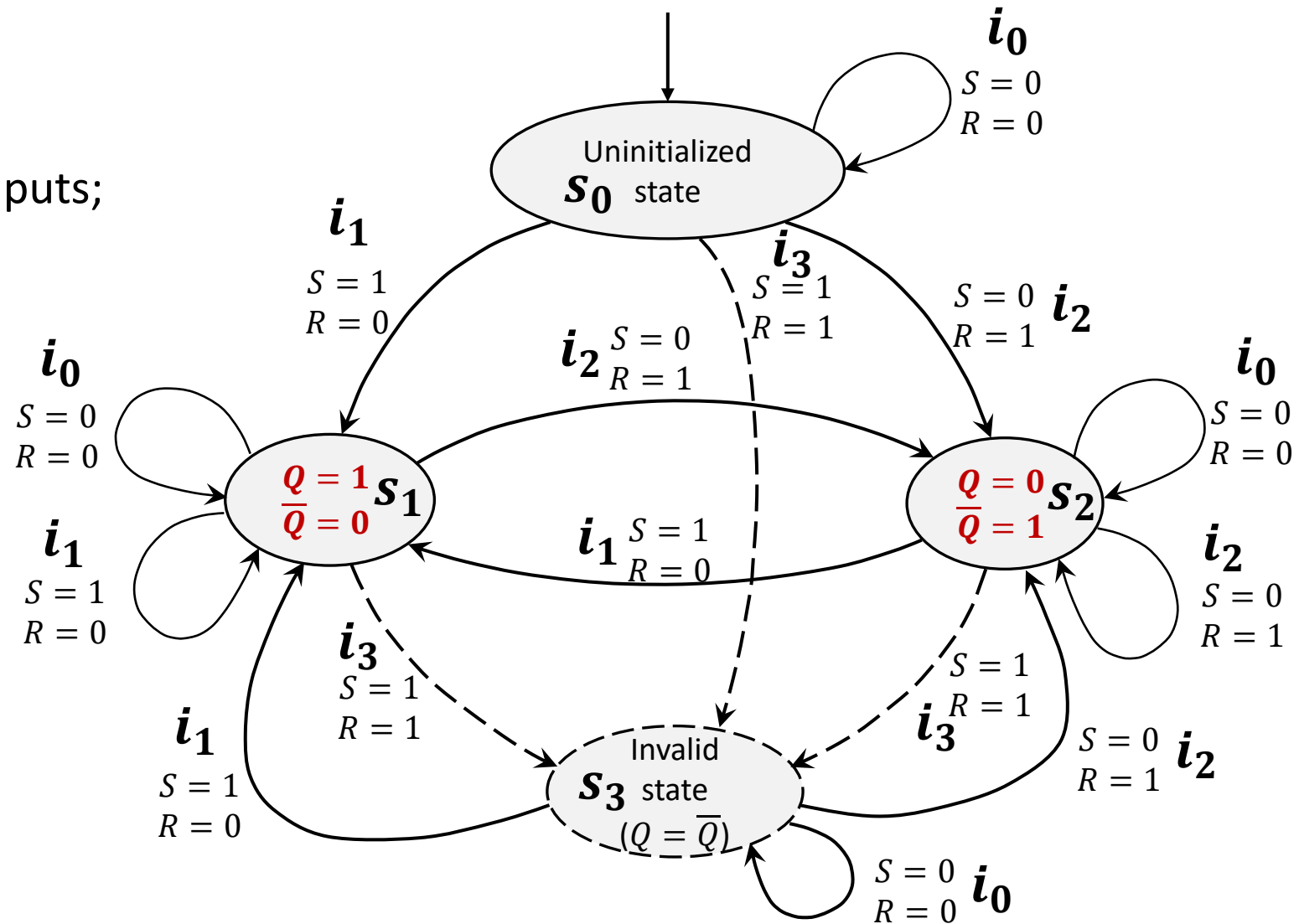
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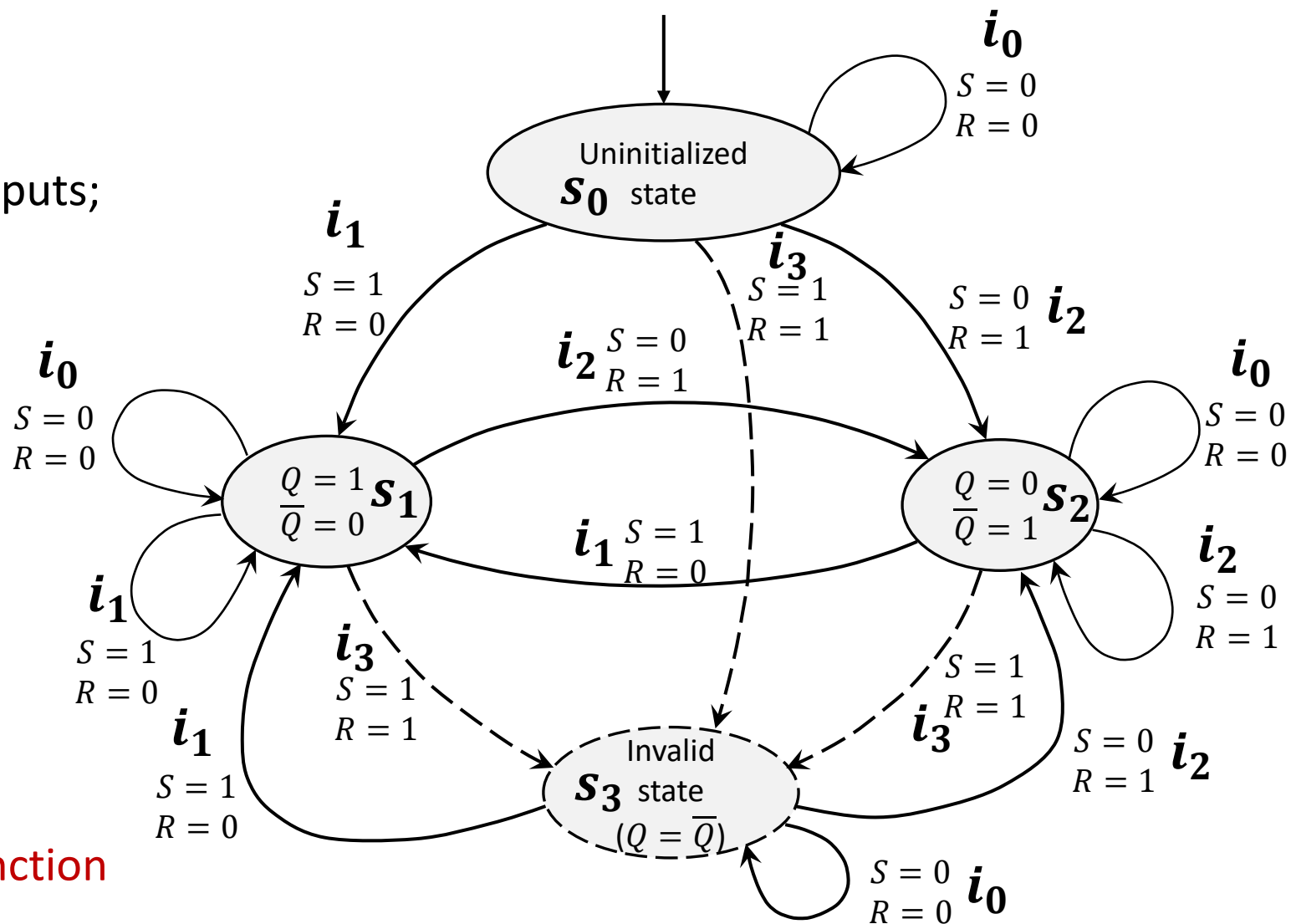
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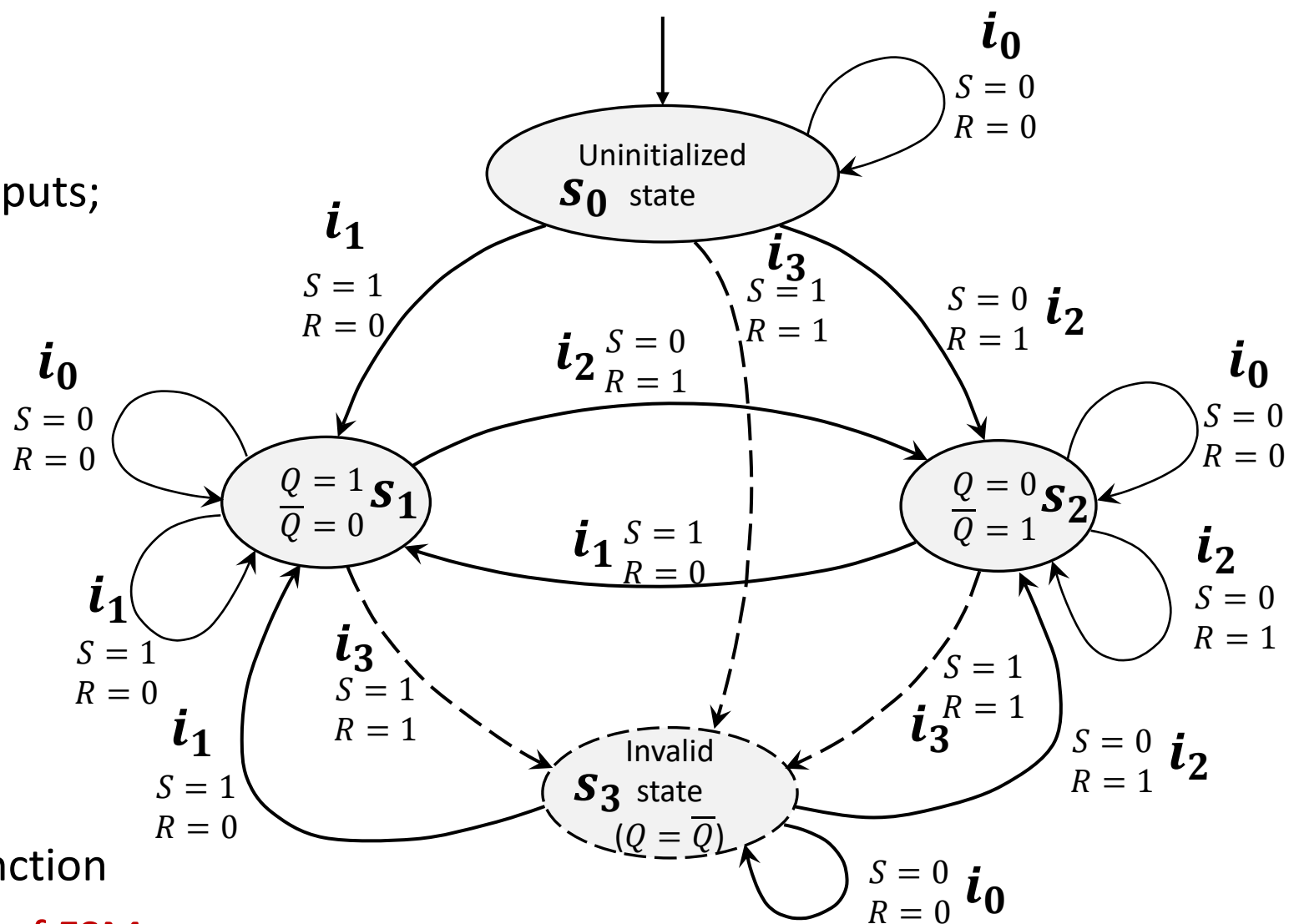
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State transition diagram – visualization of FSM



Finite State Machine (FSM) Visualization

Transition table – an alternative

Current state	Input	New state	Output
s_0	i_0	s_0	undefined
s_0	i_1	s_1	1
s_0	i_2	s_2	0
...			

State transition diagram

