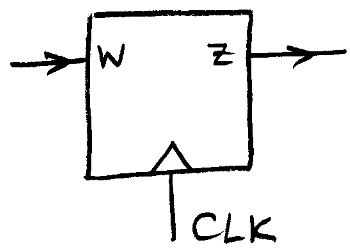
EXAMPLE OF MEALY VS. MOORE IMPLEMENTATIONS:

(p. 447, B & V.)



Z = 1 iff "during the last two clock cycles, W = 1." (not counting the current cycle.)

[• IMPLEMENT AS A MOORE MACHINE]

Step 1: Do some examples to make sure you understand the problem:

clock cycle:	t_0	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8
Example input → w:	0	1	0	1	1	0	1	1	1
derived output → z:	0	0	0	0	0	1	0	0	1

undefined initially (define z=0 initially.)

also not well-defined (choose 0.)

(well-defined from this point on.)

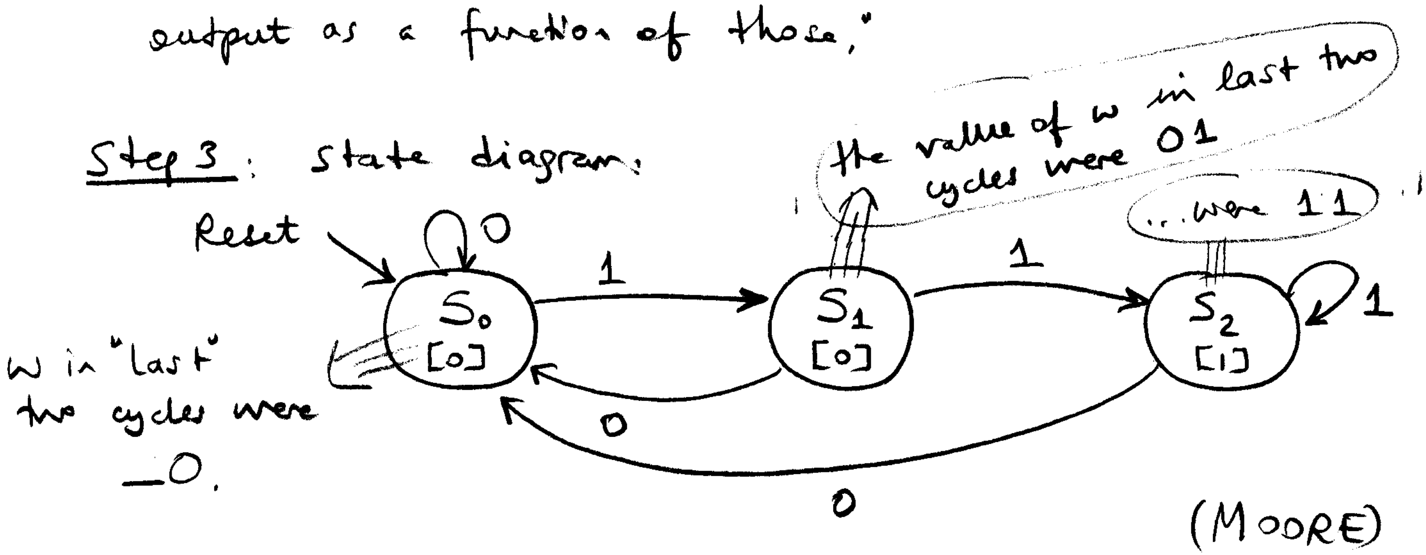
(Note: Moore machine assumed here.'. the output cannot depend on the current input.)

<u>Step 2</u>; (hardest part).

Define the <u>state</u> of the machine

<u>Idea</u>: "This machine has to "remember" both the w one clock cycle ago, and the w two clock cycles ago. If I have those, then I can determine the output as a function of those."

<u>Step 3</u>: state diagram:

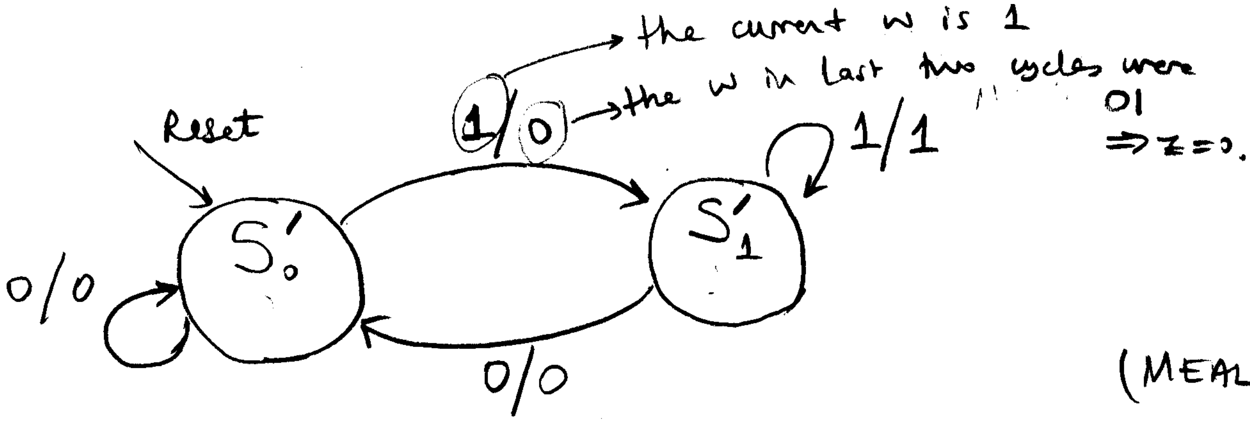


(Note: In step 1: it appears in the next cycle because has to wait for the clock edge.)

<u>Mealy</u>: output can depend on the current input.

clock cycle	t_0	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8
w	0	1	0	1	1	0	1	1	1
z	0	0	0	0	1	0	0	1	1

same pattern as Moore <u>But</u> 1 cycle early!



(MEALY)

$S_0' \equiv$ the value of w in previous cycle was 0.

$S_1' \equiv$ " " " " " " " 1.

* <u>Note</u>: Mealy implementation uses 2 states ⇒ 1 ffp. only.
* <u>Key point</u>: Because the current input is available to Mealy, it has to remember less here than MOORE.

– Examine the D-flip-flop implementation of each

<u>Moore</u>: State table:

(S2) $Q1 \cdot Q0' = Y$

X	Q1	Q0	Q1+	Q0+	Y
0	0	0	0	0	✓
1	0	0	0	1	
0	0	1	0	0	
1	0	1	1	0	
0	1	0	0	0	
1	1	0	1	0	—
X	1	1	X	X	

$\boxed{Q1^+}$

X \ Q1,Qφ	00	01	11	10
0	0	0	X	0
1	0	1	X	1

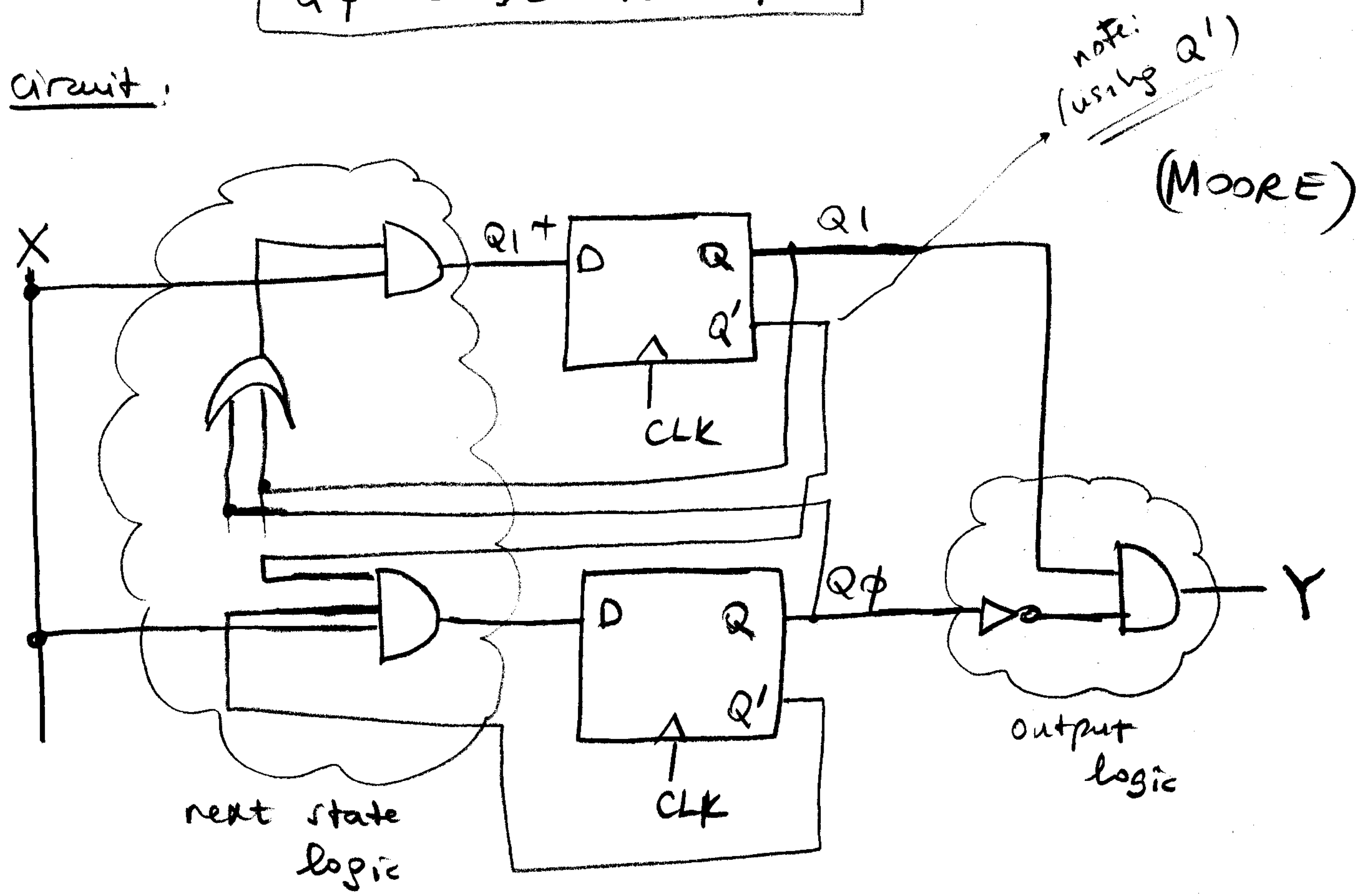
$$\boxed{Q1^+ = X \cdot [Q1 + Q\phi]}$$

$\boxed{Q\phi^+}$

X \ Q1,Qφ	00	01	11	10
0	0	0	X	0
1	1	0	X	0

$$\boxed{Q\phi^+ = X \cdot Q1' \cdot Q\phi'}$$

circuit:



Mealy:

note state assignment:

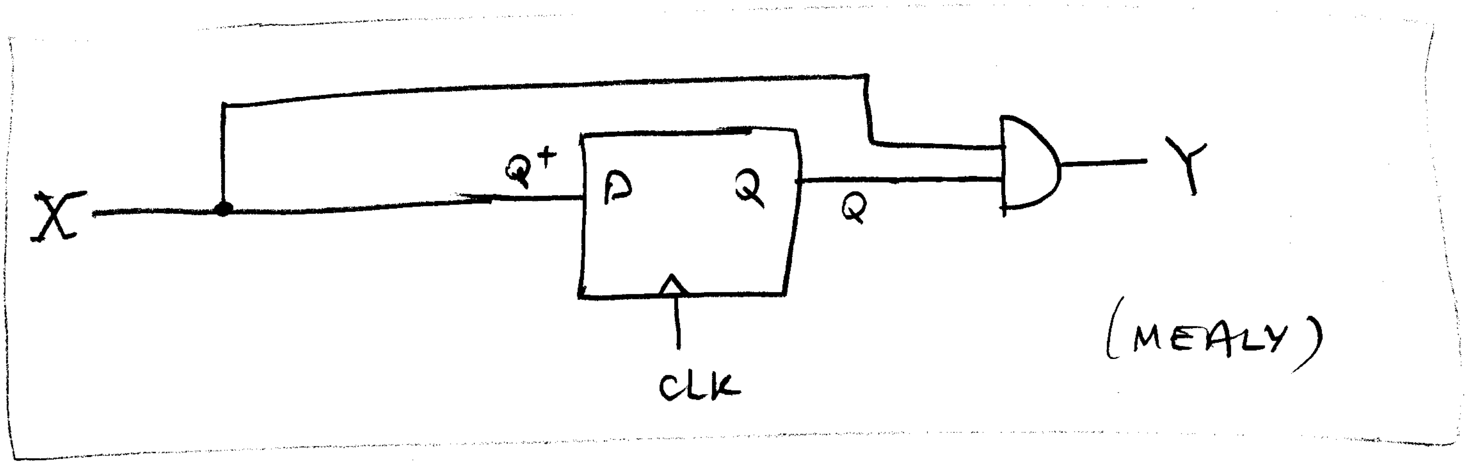
	Q
$S_0 \equiv$	0
$S_1 \equiv$	1.

state table:

X	Q	Q^+	Y
0	0	0	0
0	1	0	0
1	0	1	0
1	1	1	1

Then: $\boxed{Q^+ = X}$

$\boxed{Y = X \cdot Q}$



1 makes a lot of sense: we are ANDing the value of X in previous cycle with current value of X.

2 Mealy is much simpler and more natural here — note that difficult to make direct comparison of Mealy & Moore states

3 general caveats about Mealy still apply though.