JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Technische Informatik: Abgabe 7

Michael Mardaus Andrey Tyukin

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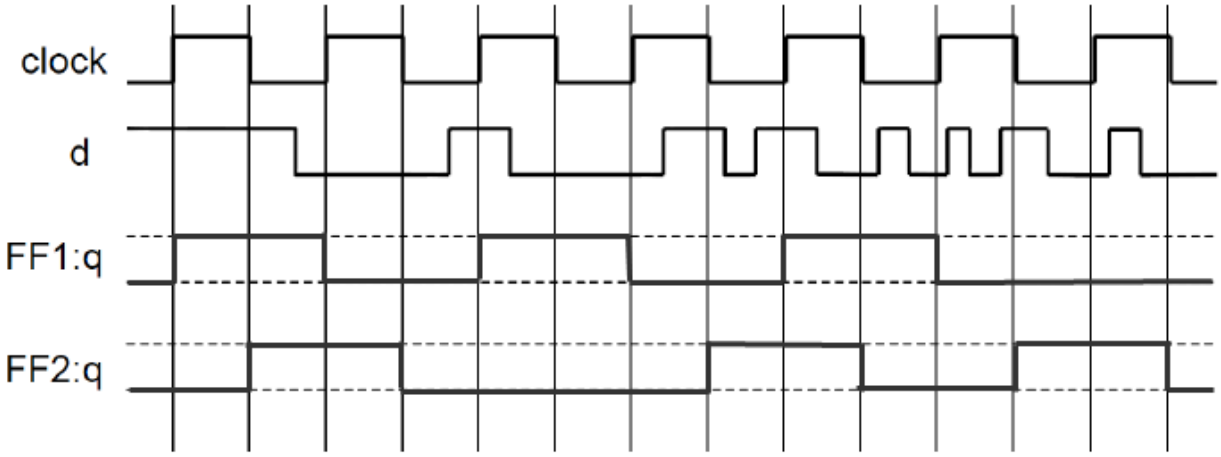
Exercise 7.1 (Flipflop logical simulation)

Let FF1 be a $0 \to 1$ flank controlled D-flipflop and FF2 a $1 \to 0$ flank controlled one.



Exercise 7.2 (Flipflops)

Exercise 7.3 (Gum machine)

We contructed an automaton with 4 states, as we do not differentiate between 15 cents and 20 cents (and even more cents). (That way we have smaller tables.)

- state 00 means 0 cents balance
- state 01 means 10 cents balance
- state 10 means 5 cents balance
- state 11 means „enough cents“ balance (≥ 15)

We have one input bit w, which is 0 if a 5 cent coin is insered and 1 if a 10 cent coin is inserted. That gives us the following state/output table:

State	Next state		Output	
	$w=0$	$w=1$	$w=0$	$w=1$
y_1y_0	Y_1Y_0	Y_1Y_0	z	z
00	10	01	0	0
01	11	11	0	0
10	01	11	0	0
11	11	11	1	1

We extract the K-maps for Y_0 and Y_1 and z and get

Y_0	y_1y_0			
w	00	01	11	10
0		1	1	1
1	1	1	1	1

$Y_0 = w + y_0 + y_1$

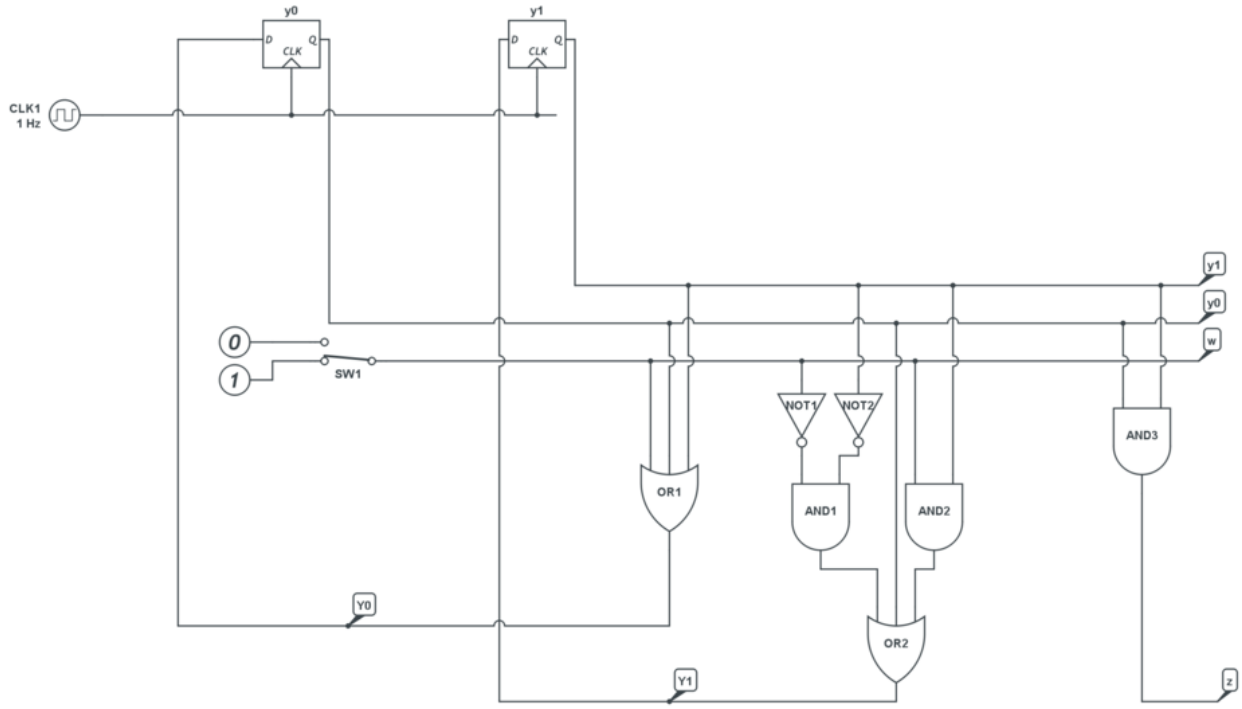
Y_1	y_1y_0			
w	00	01	11	10
0	1	1	1	
1		1	1	1

$Y_1 = \bar{w}\bar{y_1} + y_0 + wy_1$

z	y_1y_0			
w	00	01	11	10
0			1	
1			1	

$z = y_1y_2$

and that leads us to this circuit:



Exercise 7.4 (Neumann-Adder)