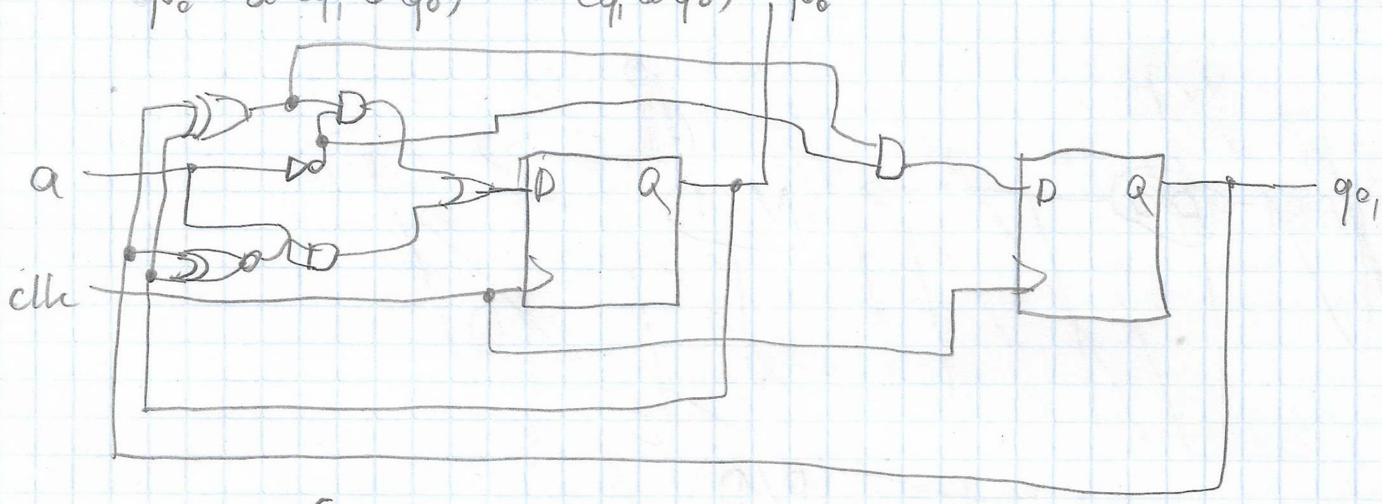
1.

$q_{o_1} = \bar{a} + \underline{q_0 q_1}$

$q_{o_0} = a(q_1 \oplus q_0) + \bar{a}(q_1 \oplus q_0)$



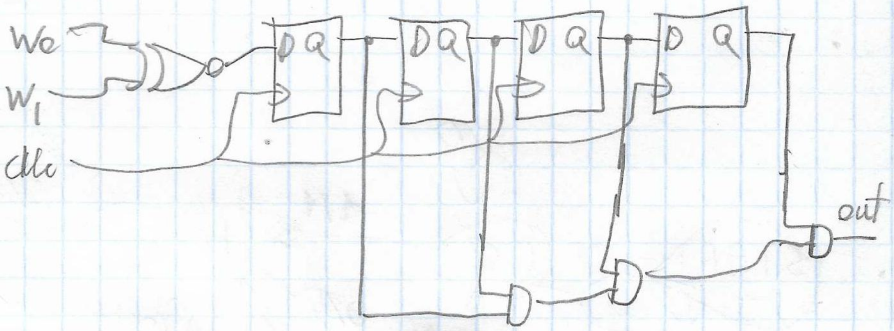
3.

q	W_0	W_1	q_0
Se	0	0	Se
Se	0	1	Sd
Se	1	0	Sd
Se	1	1	Se
Sd	0	0	Se
Sd	0	1	Sd
Sd	1	0	Sd
Sd	1	1	Se

Se - cztery ostatnie równe

Sd - cztery ostatnie nierówne

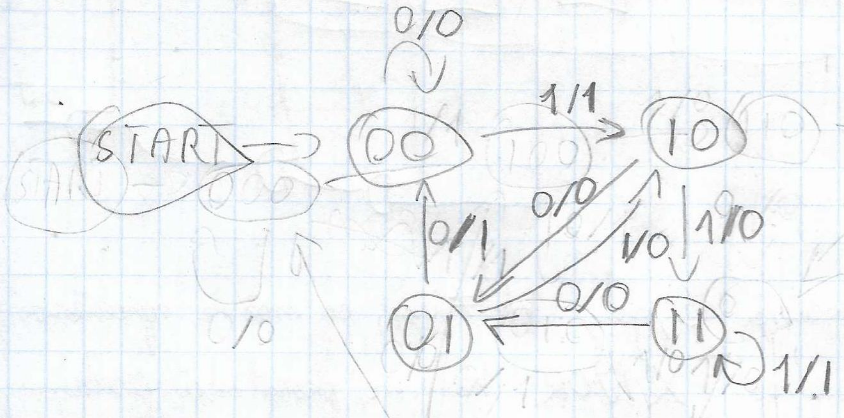
$X = q_{o_0} q_{o_1} q_{o_2} q_{o_3}$



Zmiana S, gdy $W_0 \neq W_1$, co można reprezentować za pomocą XNOR. Kolejne przerzutniki przechowują poprzednie cztery stany wejścia.

4.

$\mathcal{M} = \langle \{00, 01, 10, 11\}, \{0,1\}, \{0,1\}, \sigma, \chi, 00 \rangle$



$$\sigma(q,i) = \begin{cases} q>>>1 & , i = 0 \\ q>>1 & , i = 1 \end{cases}$$

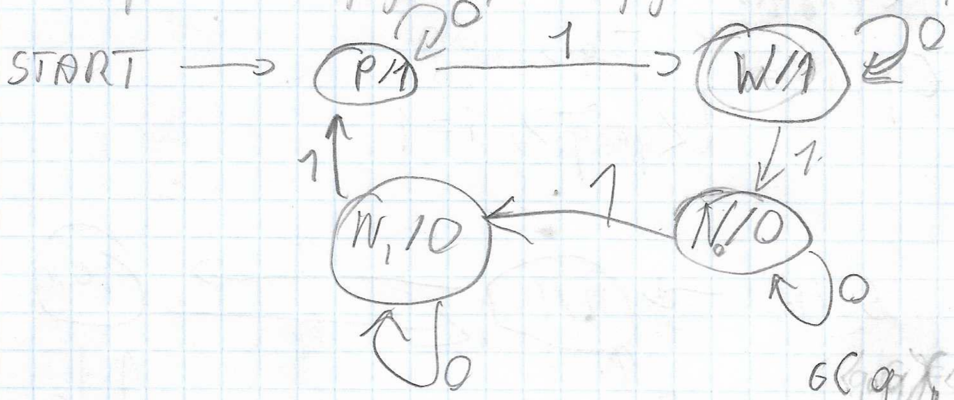
$\chi = \{(00,0,0), (00,1,1), (01,0,1), (01,1,0), (10,0,1), (10,1,0), (11,0,0), (11,1,1)\}$

σ χ

q	i	q'	o
00	0	00	0
00	1	10	1
01	0	00	1
01	1	10	0
10	0	01	1
10	1	11	0
11	0	01	0
11	1	11	1

5. $M = \langle Q, \Sigma, \Omega, \sigma, \chi, q_0 \rangle =$
$= \langle \{P, W, N_0, N_1\}, \mathbb{B}, B, \sigma, \chi, P \rangle$

P-podzielna przez 4 (liczba jedynek), W-l. jedynek o 1 większa niż podzielna przez 4, N_0 o 2 mniejsza niż podzielna, N_1 - o 1 mniejsza niż podzielna



P = 11
W = 00
N_0 = 01
N_1 = 10

$\sigma(q, i) = (q + i) \bmod 4$

χ

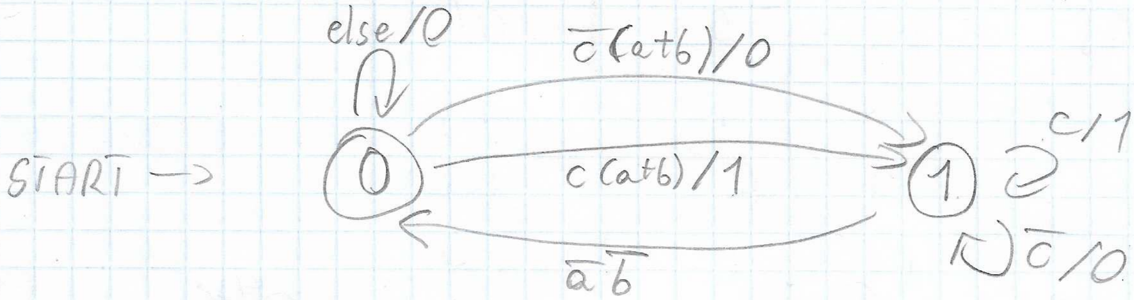
q	0
11	1
01	0
11	0
00	1

$\chi = \overline{(q[0] \oplus q[1])}$

σ

q	i	q_n
00	0	00
00	1	01
01	0	01
01	1	10
10	0	10
10	1	11
11	0	11
11	1	00

8.



6. $M = \langle Q, \Sigma, \Omega, \delta, \chi, q_0 \rangle = \langle \{P_0P_1, P_0N_1, N_0P_1, N_0N_1\}, \mathbb{B}, \mathbb{B}, \delta, \{P_0P_1\}, P_0P_1 \rangle$

$q = \langle q_0, q_1 \rangle$

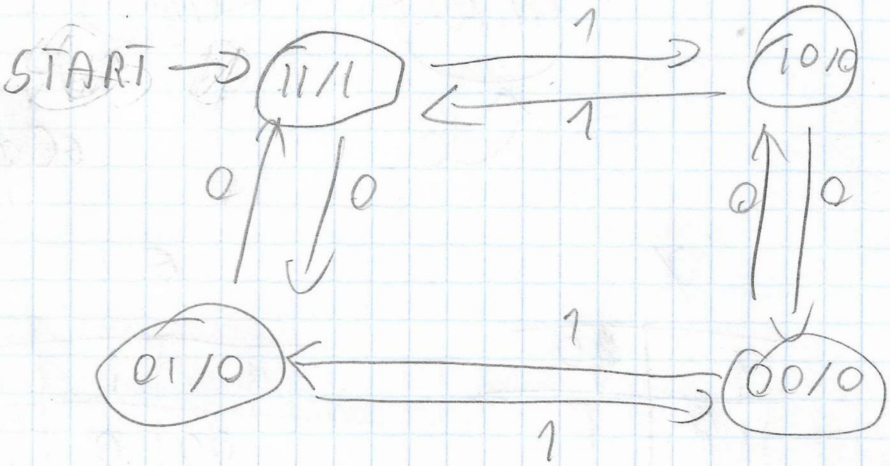
$\delta(q, i) = \begin{cases} \langle \overline{q_0}, q_1 \rangle, & i = 0 \\ \langle q_0, \overline{q_1} \rangle, & i = 1 \end{cases}$

$P_0P_1 = 11$

$P_0N_1 = 10$

$N_0P_1 = 01$

$N_0N_1 = 00$



χ

q	o
00	0
01	0
10	0
11	1

$\chi = q[0] \,\&\, q[1]$

δ

q	i	qn
00	0	10
00	1	01
01	0	11
01	1	00
10	0	00
10	1	11
11	0	01
11	1	10

7.