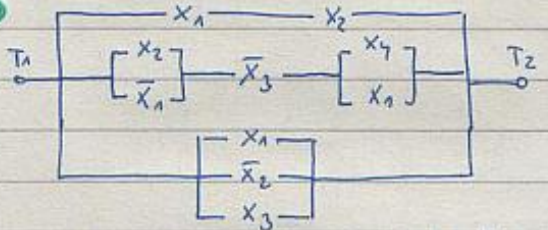
MATEMATIKA III.

P5

2005-11-03

KLOPNÉ OBVODY

* 



$(x_1 \wedge x_2) \vee \underbrace{\left(\underbrace{(x_1 \vee x_2) \wedge \bar{x}_3 \wedge (x_1 \vee x_4)}_{e}\right)}_{d} \vee \underbrace{(x_1 \vee \bar{x}_2 \vee x_3)}_{e}$

$a \quad b \quad e \quad d \quad e$

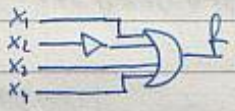
x_1	x_2	x_3	x_4	a	b	c	d	e	f	$\bar{f}$
0	0	0	0	0	1	0	0	1	1	0
0	0	0	1	0	1	1	1	1	1	0
0	0	1	0	0	1	0	0	1	1	0
0	0	1	1	0	1	1	1	1	1	0
0	1	0	0	0	1	0	0	0	0	1
0	1	0	1	0	1	1	1	0	1	0
0	1	1	0	0	1	0	0	1	1	0
0	1	1	1	0	1	1	1	1	1	0

x_1	x_2	x_3	x_4	a	b	c	d	e	f	$\bar{f}$
1	0	0	0	0	0	1	0	1	1	0
1	0	0	1	0	0	1	0	1	1	0
1	0	1	0	0	0	1	0	1	1	0
1	0	1	1	0	0	1	0	1	1	0
1	1	0	0	1	1	1	1	1	1	0
1	1	0	1	1	1	1	1	1	1	0
1	1	1	0	1	1	1	1	1	1	0
1	1	1	1	1	1	1	1	1	1	0

$f = \bar{f}(x_1; x_2; x_3; x_4) = \bar{x}_1 \wedge x_2 \wedge \bar{x}_3 \wedge \bar{x}_4 =$

$\left.\begin{array}{l} \overline{a \wedge b} = \bar{a} \vee \bar{b} \\ \overline{a \vee b} = \bar{a} \wedge \bar{b} \end{array}\right\} \Rightarrow$

$= f = \bar{\bar{f}} = \overline{\bar{x}_1 \wedge x_2 \wedge \bar{x}_3 \wedge \bar{x}_4} = \underline{\underline{x_1 \vee \bar{x}_2 \vee x_3 \vee x_4}}$



* $x \wedge y \equiv x \cdot y$
  $x \vee y \equiv x + y$

$f = \bar{x}_1\bar{x}_2\bar{x}_3\bar{x}_4 \vee \bar{x}_1\bar{x}_2\bar{x}_3x_4 \vee \bar{x}_1\bar{x}_2x_3\bar{x}_4 \vee \bar{x}_1\bar{x}_2x_3x_4 \vee \bar{x}_1x_2x_3x_4 \vee x_1\bar{x}_2\bar{x}_3\bar{x}_4 \vee x_1x_2\bar{x}_3\bar{x}_4$

0000 0001 0010 0011 0111 1000 1100

Quine-McCluskeyho algoritmus

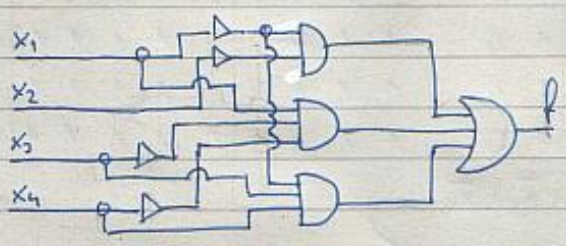
0000 x	0000 x	000 - x
0001 x	0001 x	00 - 0 x
0010 x	0010 x	- 000
1000 x	1000 x	00 - 1 x
0011 x	0011 x	001 - x
1100 x	1100 x	1 - 00
0111	0111 x	0 - 11

00 - -

	0000, 0001, 0010, 1000, 0011, 1100, 0111,
00 - -	⊗ ⊗ ⊗ ⊗
- 000	x x
1 - 00	⊗ ⊗
0 - 11	⊗ ⊗

1 krát

$f = \bar{x}_1\bar{x}_2 \vee x_1\bar{x}_3\bar{x}_4 \vee \bar{x}_1 x_3 x_4$



- $f = 000 \vee 010 \vee 001 \vee 110 \vee 011 \vee 111$

000 x	0 - 0 x
010 x	00 - x
001 x	- 10 x
110 x	01 - x
011 x	0 - 1 x
111 x	11 - x
	- 11 x

	000, 010, 001, 110, 011, 111
0 - -	⊗ ⊗ ⊗ ⊗
- 1 -	⊗ ⊗ ⊗ ⊗

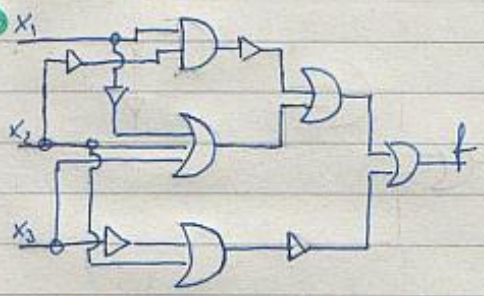
$f = \bar{x}_1 \vee x_2$

			000	100	010	011	101	111
000 ×	-00	-00	⊗	⊗				
100 ×	0-0	0-0	☒		☒			
010 ×	10-	10-		☒			☒	
011 ×	01-	01-			⊗	⊗		
101 <	-11	-11				☒		☒
111 ×	1-1	1-1					⊗	⊗

Musíme vybrat libovolný sloupec → nikde musí jen 1 křížek.

○ $f = \bar{x}_2\bar{x}_3 \vee \bar{x}_1x_2 \vee x_1x_3$

□ $f = \bar{x}_1\bar{x}_2 \vee x_1\bar{x}_2 \vee x_2x_3$



$$f = \overline{(x_1 \wedge \bar{x}_2) \vee (\bar{x}_1 \vee x_2 \vee x_3)} \vee \overline{(x_2 \vee \bar{x}_3)}$$

$$\overline{(x_1 \wedge \bar{x}_2)} \wedge \overline{(\bar{x}_1 \vee x_2 \vee x_3)}$$

$$\left((x_1 \wedge \bar{x}_2) \wedge (x_1 \wedge \bar{x}_2 \wedge \bar{x}_3)\right) \vee (\bar{x}_2 \wedge x_3)$$

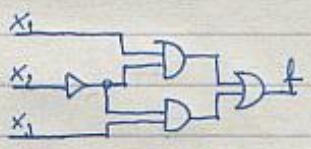
x_1	x_2	x_3	a	b	c	d	f	
0	0	0	0	0	0	0	0	
0	0	1	0	0	0	1	1	×
0	1	0	0	0	0	0	0	
0	1	1	0	0	0	0	0	
1	0	0	1	1	1	0	1	×
1	0	1	1	0	0	1	1	×
1	1	0	1	0	0	0	0	
1	1	1	1	0	0	0	0	

001 × −01

100 < 10-

101 <

$f = \bar{x}_2x_3 \vee x_1\bar{x}_2$



MATEMATIKA III.

C5

2005-11-03

KLOPNÉ OBVODY

0000 ×	000-	00--
0001 ×	00-0	0-1-
0010 ×	00-1	--11
0011 ×	001-	-11-
0110 ×	0-10	11--
1100 ×	0-11	
0111 ×	-011	
1011 ×	011-	
1101 ×	-110	
1110 ×	110-	
1111 ×	11-0	
	-111	
	1-11	
	11-1	
	1111	

	00--	0-1-	--11	-11-	11--
0000	⊗				
0001	⊗				
0010	⊗	⊗			
0011	⊗	⊗	⊗		
0110		⊗		×	
1100					⊗
0111		⊗	⊗	×	
1011			⊗		
1101					⊗
1110				×	⊗
1111			⊗	×	⊗

$f = \bar{x}_1\bar{x}_2 \vee \bar{x}_1x_3 \vee x_3x_4 \vee x_2x_3 \vee x_1x_2$

KONEČNÉ AUTOMATY

Df $A = (S; I; O; \delta; \theta)$ S stavy, I vstupy, O výstupy

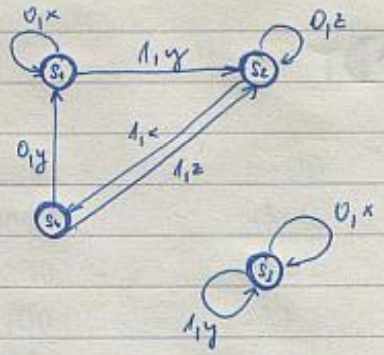
$\delta: S \times I \to S$, $\theta: S \times I \to O$

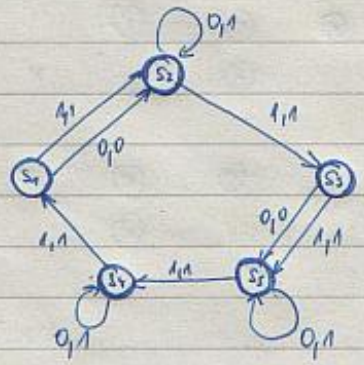
$S = \{0;1;2\}$ $I = \{0;1\}$ $O = \{0;1;2\}$ zbytek po dělení 3

S	δ 0	δ 1	θ 0	θ 1
0	0	1	0	1
1	1	2	1	2
2	2	0	2	3

3 : 3 = 0

A	δ 0	δ 1	θ 0	θ 1
S_1	S_1	S_2	x	y
S_2	S_2	S_4	z	x
S_3	S_3	S_1	x	y
S_4	S_1	S_2	y	z





A	δ 0	δ 1	θ 0	θ 1
S_1	S_2	S_2	0	1
S_2	S_2	S_3	1	1
S_3	S_5	S_5	0	1
S_4	S_4	S_1	1	1
S_5	S_5	S_4	1	1

A	δ 0	δ 1	θ 0	θ 1
1	2	5	1	0
2	5	5	1	1
3	1	8	1	1
4	8	2	1	0
5	6	5	1	1
6	1	5	1	1
7	2	3	1	0
8	3	5	1	1

1: $\{1;4;7\}; \{2;3;5;6;8\}$
2: $\{1;4;7\}; \{2;5;6\}; \{3;6\}$
3: $\{1;4\}; \{7\}; \{2\}; \{5;8\}; \{3;6\}$
4: $\{1\}; \{4\}; \{7\}; \{2\}; \{5;8\}; \{3;6\}$
5: $\{1\}; \{4\}; \{7\}; \{2\}; \{5;8\}; \{3;6\}$

$\bar{1}$ $\bar{4}$ $\bar{7}$ $\bar{2}$ $\bar{5}$ $\bar{3}$

A	δ 0	δ 1	θ 0	θ 1
$\bar{1}$	$\bar{2}$	$\bar{5}$	1	0
$\bar{2}$	$\bar{5}$	$\bar{5}$	1	1
$\bar{3}$	$\bar{1}$	$\bar{5}$	1	1
$\bar{4}$	$\bar{5}$	$\bar{2}$	1	0
$\bar{5}$	$\bar{3}$	$\bar{5}$	1	1
$\bar{7}$	$\bar{2}$	$\bar{3}$	1	0

	δ		θ	
A	0	1	0	1
1	2	5	1	0
2	3	6	0	0
3	1	6	1	0
4	2	5	0	0
5	6	1	1	0
6	3	2	0	0

$1: \{1;3;5\}; \{2;4;6\}$

$2: \underset{\bar{1}}{\{1;5\}}; \underset{\bar{3}}{\{3\}}; \underset{\bar{2}}{\{2;6\}}; \underset{\bar{4}}{\{4\}}$

	δ		θ	
A	0	1	0	1
$\bar{1}$	$\bar{2}$	$\bar{1}$	1	0
$\bar{2}$	$\bar{3}$	$\bar{2}$	0	0
$\bar{3}$	$\bar{1}$	$\bar{2}$	1	0
$\bar{4}$	$\bar{2}$	$\bar{1}$	0	0

	δ		θ	
A	0	1	0	1
1	5	2	0	0
2	7	5	1	1
3	5	4	0	1
4	4	3	1	1
5	3	6	0	1
6	2	3	1	1
7	6	5	1	1

$1: \{1\}; \{2;4;6;7\}; \{3;5\}$

$2: \underset{\bar{1}}{\{1\}}; \underset{\bar{2}}{\{2;4;6;7\}}; \underset{\bar{3}}{\{3;5\}}$

	0	1	0	1
$\bar{1}$	$\bar{3}$	$\bar{2}$	0	0
$\bar{2}$	$\bar{2}$	$\bar{3}$	1	1
$\bar{3}$	$\bar{3}$	$\bar{2}$	0	1