

<i>TTÜ VIRUMAA KOLLEDŽ</i>	
<i>Reaalainete keskus</i>	<i>Mikroprotsessortehnika</i>
Üliõpilane:	Tehtud:
Õpperühm:	Arvestatud:
Töö nr. ja nimetus: №1 Loogikafunktsiooni minimeerimine	

Logic Converter-XLC1
Word Generator-XWG1
Logic Analyzer-XLA1

Loogiline avaldis

$$y = \bar{a}\bar{b}c + abc + bd(\bar{c}\bar{d} + b)(\bar{a}\bar{d} + bd)(\bar{a}c + bc) + abcd(\bar{c} + ab)$$

Ülesanne

Minimeerida loogiline avaldis ja teha skeem.

$$y = \bar{a}\bar{b}c + abc + bd(\bar{c}\bar{d} + b)(\bar{a}d + bd)(\bar{a}c + bc) + abcd(\bar{c} + ab)$$

Minimeerimise käik

$$\begin{aligned} & \bar{a}\bar{b}c + abc + bd(\bar{c}\bar{d} + b)(\bar{a}d + bd)(\bar{a}c + bc) + abcd(\bar{c} + ab) = \\ & ac(\bar{b} + b) + (bdc\bar{d} + bd)(\bar{a}dc + bd\bar{a}c + \bar{a}dbc + dc) + abcd\bar{c} + abcdab = \\ & ac + bd(cd + 1)\bar{a}c(d + bd) + abcd = \\ & ac + bd\bar{a}cd + bd\bar{a}cbd + abcd = \\ & ac + bcd(\bar{a} + \bar{a} + a) = \\ & ac + cbd \end{aligned}$$

Minimeerimisel kasutatud valemid

$$a \cdot a = a$$

$$a + a = a$$

$$a \cdot 1 = a$$

$$a \cdot 0 = 0$$

$$a + 1 = 1$$

$$a + 0 = a$$

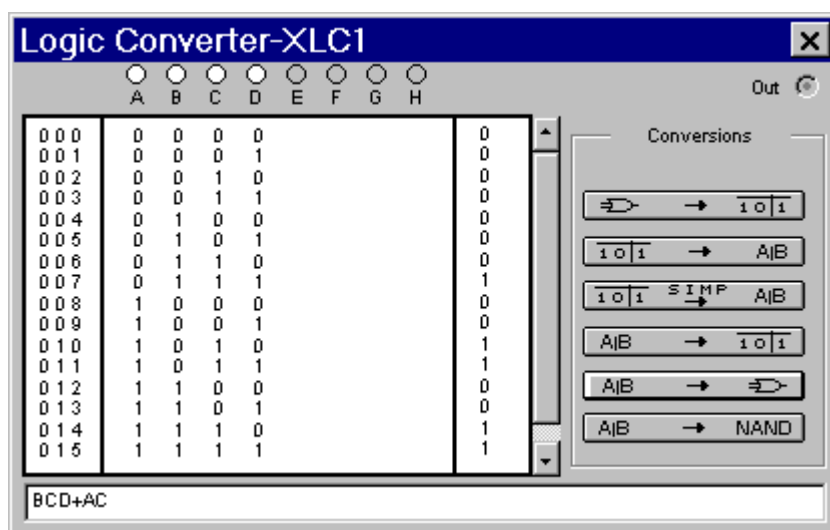
$$a \cdot \bar{a} = 0$$

$$a + \bar{a} = 1$$

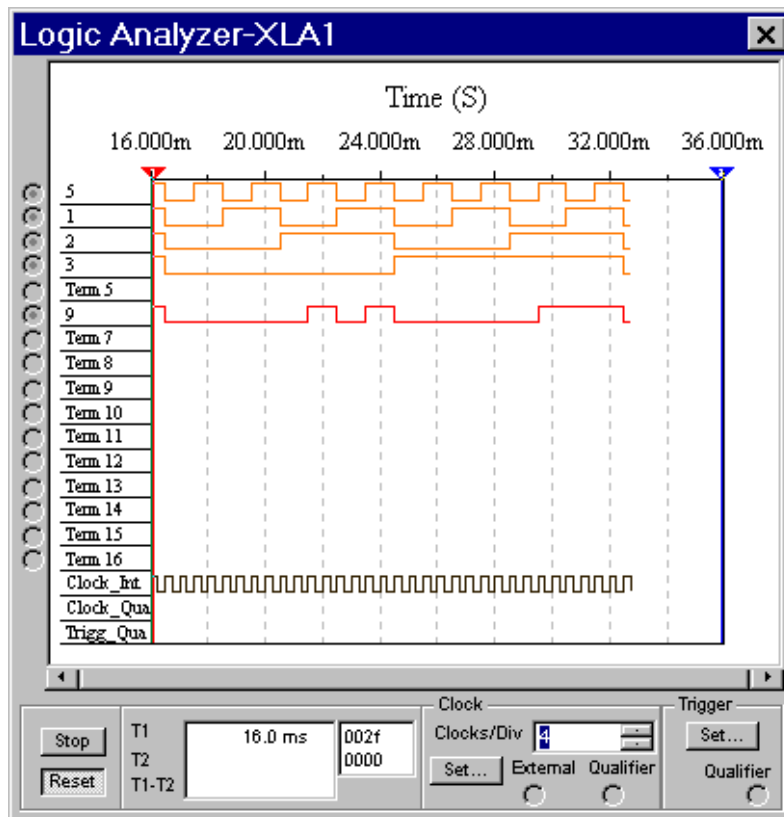
$$a + a \cdot \bar{b} = a + b$$

Minimeerimise kontroll

Loogikakonverter võimaldab minimeerida loogikavõrrandit, koostada olekutabelit ning loogikaskeemi.



Joonis 1. Loogikakonverter



Joonis 4. Loogikaanalüsaator

Olekutabel iseloomustab skeemi erinevate olekute käitumist.

Tabel 1. Olekutabel

	A	B	C	D	y
0	0	0	0	0	0
1	0	0	0	1	0
2	0	0	1	0	0
3	0	0	1	1	0
4	0	1	0	0	0
5	0	1	0	1	0
6	0	1	1	0	0
7	0	1	1	1	1
8	1	0	0	0	0
9	1	0	0	1	0
A	1	0	1	0	1
B	1	0	1	1	1
C	1	1	0	0	0
D	1	1	0	1	0
E	1	1	1	0	1
F	1	1	1	1	1

Järeldus

Vastavalt eelpooltoodud tabelile (tabel 1), on olekute 7,A,B,E,F väljundiks 1.

Tabel 2. Ülesannete variandid

N ^o	Loogiline avaldis	
1	$y = \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}\bar{d} + \bar{a}\bar{c}\bar{d} + \bar{b}\bar{c}\bar{d} + \bar{a}\bar{b}\bar{c}\bar{d}$	$y = abc + abd + acd + bcd + abcd$
2	$y = ab + bc + ca$	$y = \bar{a}\bar{b} + \bar{b}\bar{c} + \bar{c}\bar{a}$
3	$y = (a + b)(b + c)(c + a)$	$y = (\bar{a} + \bar{b})(\bar{b} + \bar{c})(\bar{c} + \bar{a})$
4	$y = \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}\bar{c} + abc$	$y = \bar{a}bc + \bar{a}\bar{b}c + ab\bar{c} + \bar{a}\bar{b}\bar{c}$
5	$y = \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}\bar{c} + abc$	$y = abc + \bar{a}bc + \bar{a}\bar{b}c + ab\bar{c} + \bar{a}\bar{b}\bar{c}$
6	$y = \bar{a}bc + \bar{a}\bar{b}c + ab\bar{c} + abc$	$y = \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}\bar{c}$
7	$y = \bar{a}\bar{b}\bar{c} + abc + bd(\bar{c}\bar{d} + b)(\bar{a}\bar{d} + bd) + abcd(\bar{c} + ab)$	$y = \bar{a}\bar{b}\bar{c} + abc + bd(\bar{c}\bar{d} + b)(\bar{a}\bar{d} + bd) \times (\bar{a}c + bc) + abcd(\bar{c} + ab)$
8	$y = \bar{a}\bar{b}\bar{c} + abc + bd(\bar{c}\bar{d} + b)(\bar{a}\bar{d} + bd)$	$y = \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}\bar{c} + \bar{b}\bar{d}(\bar{c}\bar{d} + \bar{b})(\bar{a}\bar{d} + \bar{b}\bar{d})$
9	$y = abc + bd(\bar{c}\bar{d} + b)(\bar{a}\bar{d} + bd) + abcd(\bar{c} + ab)$	$y = \bar{a}\bar{b}\bar{c} + \bar{b}\bar{d}(\bar{c}\bar{d} + \bar{b})(\bar{a}\bar{d} + \bar{b}\bar{d}) + \bar{a}\bar{b}\bar{c}\bar{d}(c + \bar{a}\bar{b})$
10	$y = \bar{a}\bar{b}\bar{c} + bd(\bar{c}\bar{d} + b)(\bar{a}\bar{d} + bd)$	$y = \bar{a}\bar{b}\bar{c} + \bar{b}\bar{d}(\bar{c}\bar{d} + \bar{b})(\bar{a}\bar{d} + \bar{b}\bar{d})$