

# Arhitectura calculatoarelor si sisteme de operare

## Rezolvari exercitii Seminar 2

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## Sumar realizare diagrama + minimizare:

- se vor completa cu 1 in diagrama doar locatiile ale caror etichete codifica intrarile pentru care functia este 1
- se vor cauta blocuri de valori de 1, de forma dreptunghiulara, cu  $2^k$  elemente, cat mai mari si cat mai putine
  - fiecare celula dintr-un bloc de  $2^k$  elemente trebuie sa aiba k vecini
- fiecarui bloc ii va corespunde un termen conjunctie in care apar doar variabilele a caror eticheta este constanta pentru toate celulele blocului
  - negate daca au eticheta 0
  - fara negatie daca au eticheta 1
- termenii obtinuti se leaga prin disjunctie

Minimizati utilizand diagrame Karnaugh functiile date prin  $\Sigma$  – *notatie*:

- a)  $\Sigma(0, 2, 7, 8, 15) + \Sigma^*(10, 11, 14)$
- b)  $\Sigma(4, 5, 10, 11, 13, 15) + \Sigma^*(2, 7)$
- c)  $\Sigma(0, 1, 2, 3, 5, 8, 15) + \Sigma^*(7)$
- d)  $\Sigma(0, 1, 2, 4, 5, 7, 11, 15) + \Sigma^*(8, 9)$
- e)  $\Sigma(0, 2, 4, 5, 6, 8, 10, 13, 15) + \Sigma^*(7, 11)$
- f)  $\Sigma(0, 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, 14, 15) + \Sigma^*(1, 9)$
- g)  $\Sigma(8, 12, 21, 23, 24, 28) + \Sigma^*(2, 6, 9, 10, 14, 18, 22, 25, 26, 30)$

Minimizarile pot fi verificate aici:

- <http://www.32x8.com/index.html>

## Rezolvare a)

$\Sigma(0, 2, 7, 8, 15) + \Sigma^*(10, 11, 14)$  - maximul valorilor din paranteza e 15 (se scrie pe minim 4 biti)  $\rightarrow$  4 variabile booleene

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	1			1
	01			1	
	11			1	*
	10	1		*	*

$$0_{(10)} = 0000_{(2)}$$

$$2_{(10)} = 0010_{(2)}$$

$$7_{(10)} = 0111_{(2)}$$

$$8_{(10)} = 1000_{(2)}$$

$$10_{(10)} = 1010_{(2)}$$

$$11_{(10)} = 1011_{(2)}$$

$$14_{(10)} = 1110_{(2)}$$

$$15_{(10)} = 1111_{(2)}$$

## Rezolvare a)

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	1			1
	01			1	
	11			1	*
	10	1		*	*

$$B \cdot C \cdot D + \overline{B} \cdot \overline{D}$$

## Rezolvare b)

$\Sigma(4, 5, 10, 11, 13, 15) + \Sigma^*(2, 7)$  - maximul valorilor din paranteza e 15 (se scrie pe minim 4 biti)  $\rightarrow$  4 variabile booleene

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00				*
	01	1	1	*	
	11		1	1	
	10			1	1

$$2_{(10)} = 0010_{(2)}$$

$$4_{(10)} = 0100_{(2)}$$

$$5_{(10)} = 0101_{(2)}$$

$$7_{(10)} = 0111_{(2)}$$

$$10_{(10)} = 1010_{(2)}$$

$$11_{(10)} = 1011_{(2)}$$

$$13_{(10)} = 1101_{(2)}$$

$$15_{(10)} = 1111_{(2)}$$

## Rezolvare b)

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00				*
	01	1	1	*	
	11		1	1	
	10			1	1

$$\bar{A} \cdot B \cdot \bar{C} + B \cdot D + A \cdot \bar{B} \cdot C$$

## Rezolvare c)

$\Sigma(0, 1, 2, 3, 5, 8, 15) + \Sigma^*(7)$  - maximul valorilor din paranteza e 15 (se scrie pe minim 4 biti)  $\rightarrow$  4 variabile booleene

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	1	1	1	1
	01		1	*	
	11			1	
	10	1			

$$0_{(10)} = 0000_{(2)}$$

$$1_{(10)} = 0001_{(2)}$$

$$2_{(10)} = 0010_{(2)}$$

$$3_{(10)} = 0011_{(2)}$$

$$5_{(10)} = 0101_{(2)}$$

$$7_{(10)} = 0111_{(2)}$$

$$8_{(10)} = 1000_{(2)}$$

$$15_{(10)} = 1111_{(2)}$$



## Rezolvare c)

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	1	1	1	1
	01		1	*	
	11			1	
	10	1			

$$\bar{A} \cdot \bar{B} + \bar{A} \cdot D + B \cdot C \cdot D + \bar{B} \cdot \bar{C} \cdot \bar{D}$$

## Rezolvare d)

$\Sigma(0, 1, 2, 4, 5, 7, 11, 15) + \Sigma^*(8, 9)$  - maximul valorilor din paranteza e 15  
(se scrie pe minim 4 biti)  $\rightarrow$  4 variabile booleene

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	1	1		1
	01	1	1	1	
	11			1	
	10	*	*	1	

$$0_{(10)} = 0000_{(2)}$$

$$1_{(10)} = 0001_{(2)}$$

$$2_{(10)} = 0010_{(2)}$$

$$4_{(10)} = 0100_{(2)}$$

$$5_{(10)} = 0101_{(2)}$$

$$7_{(10)} = 0111_{(2)}$$

$$8_{(10)} = 1000_{(2)}$$

$$9_{(10)} = 1001_{(2)}$$

$$11_{(10)} = 1011_{(2)}$$

$$15_{(10)} = 1111_{(2)}$$

## Rezolvare d)

		$CD$			
		00	01	11	10
$AB$	00	1	1		1
	01	1	1	1	
	11			1	
	10	*	*	1	

$$\bar{A} \cdot \bar{C} + \bar{B} \cdot \bar{C} + B \cdot C \cdot D + A \cdot C \cdot D$$

## Rezolvare e)

$\Sigma(0, 2, 4, 5, 6, 8, 10, 13, 15) + \Sigma^*(7, 11)$  - maximul valorilor din paranteza e 15 (se scrie pe minim 4 biti)  $\rightarrow$  4 variabile booleene

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	1			1
	01	1	1	*	1
	11		1	1	
	10	1		*	1

$$0_{(10)} = 0000_{(2)}$$

$$2_{(10)} = 0010_{(2)}$$

$$4_{(10)} = 0100_{(2)}$$

$$5_{(10)} = 0101_{(2)}$$

$$6_{(10)} = 0110_{(2)}$$

$$7_{(10)} = 0111_{(2)}$$

$$8_{(10)} = 1000_{(2)}$$

$$10_{(10)} = 1010_{(2)}$$

$$11_{(10)} = 1011_{(2)}$$

$$13_{(10)} = 1101_{(2)}$$

## Rezolvare e)

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	1			1
	01	1	1	*	1
	11		1	1	
	10	1		*	1

$$B \cdot D + \overline{A} \cdot \overline{D} + \overline{B} \cdot \overline{D}$$

## Rezolvare f)

$\Sigma(0, 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, 14, 15) + \Sigma^*(1, 9)$  - maximul valorilor din paranteza e 15 (se scrie pe minim 4 biti)  $\rightarrow$  4 variabile booleene

		CD			
		00	01	11	10
AB	00	1	*	1	1
	01	1		1	1
	11	1	1		1
	10	1*	1	1	1

$$0_{(10)} = 0000_{(2)}$$

$$1_{(10)} = 0001_{(2)}$$

$$2_{(10)} = 0010_{(2)}$$

$$3_{(10)} = 0011_{(2)}$$

$$4_{(10)} = 0100_{(2)}$$

$$6_{(10)} = 0110_{(2)}$$

$$7_{(10)} = 0111_{(2)}$$

$$8_{(10)} = 1000_{(2)}$$

$$9_{(10)} = 1001_{(2)}$$

$$10_{(10)} = 1010_{(2)}$$

## Rezolvare f)

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	1	*	1	1
	01	1		1	1
	11	1	1	1	1
	10	1	*	1	1

$$C + A + D$$

## Rezolvare f)

$\Sigma(0, 2, 5, 7, 13, 16, 21, 23, 29)$  - maximul valorilor din paranteza e 29 (se scrie pe minim 5 biti)  $\rightarrow$  5 variabile booleene

CDE									
AB		000	001	011	010	110	111	101	100
	00				*	*			
	01	1	*		*	*			1
	11	1	*		*	*			1
	10				*	*	1	1	

$$\overline{B} \cdot \overline{C} \cdot \overline{D} \cdot \overline{E} + \overline{A} \cdot \overline{B} \cdot \overline{C} \cdot \overline{E} + C \cdot \overline{D} \cdot E + \overline{B} \cdot C \cdot E$$



## Rezolvare f)

CDE		000	001	011	010	110	111	101	100
AB	00				*	*			
	01	1	*		*	*			1
	11	1	*		*	*			1
	10				*	*	1	1	

$$B \cdot \bar{E} + A \cdot \bar{B} \cdot C \cdot E$$