Eletrônica Digital
Sistema de Numeração

→ Base N p/ base 10

$143_5 = 3.5^0 + 4.5^1 + 1.5^2 = \boxed{48_{10}}$

$110011_2 = 1.2^0 + 1.2^1 + 0.2^2 + 0.2^3 + 1.2^4 + 1.2^5 = \boxed{51_{10}}$

→ Base 10 p/ base N

25_{10} → base 2

25 | 2 → 12 | 2 → 6 | 2 → 3 | 2 → 1

24 12 12 6 6 3 2 1

(1) (0) (0) (1)

$\boxed{11001_2}$

30_{10} → base 16

30 | 16

14 1

(14)

$\boxed{1E_{16}}$

→ Base 2 p/ base 2^N

0100111001110011100_2 → base 16

sendo $16 = 2^4$, Agrupamos os dígitos em 4

0100 1110 0111 0011 1001

4 E 7 3

$\boxed{4E73_{16}}$

→ Base 2^N p/ base 2

$4E39_{16}$ p/ base 2

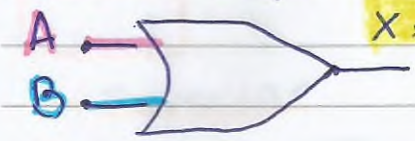
0100 1110 0011 1001

$\boxed{100111000111001_2}$

DISCIPLINA: ELETRÔNICA DIGITAL MATÉRIA: PORTAS LÓGICAS DATA: Nº 1

Eletrônica Digital
Portas Lógicas

Porta OR



OR

A	B	X = A+B
0	0	0
0	1	1
1	0	1
1	1	1

Porta AND

AND

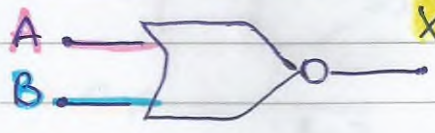
A	B	X = AB
0	0	0
0	1	0
1	0	0
1	1	1

Operação Not

NOT

A	X = Ā
0	1
1	0

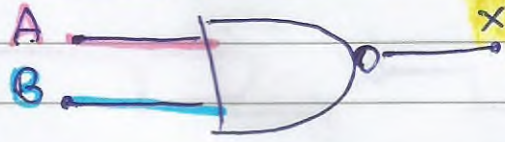
Porta Nor



NOR

A	B	X = A+B
0	0	1
0	1	0
1	0	0
1	1	0

Porta Nand



NAND

A	B	X = AB
0	0	1
0	1	1
1	0	1
1	1	0

/ /

Eletrônica digital

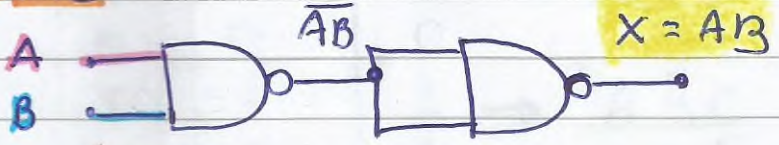
Universalidade das portas Nand e Nor

*Nand

- Inversor

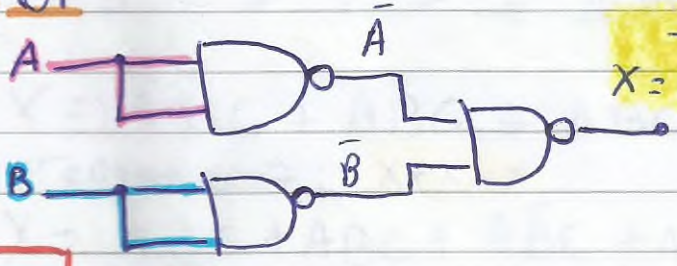
$X = \overline{A \cdot A} = \overline{A}$

- And



$X = AB$

- Or



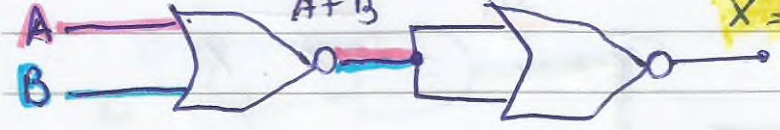
$X = \overline{\overline{A}\,\overline{B}} = A + B$

*Nor

- Inversor

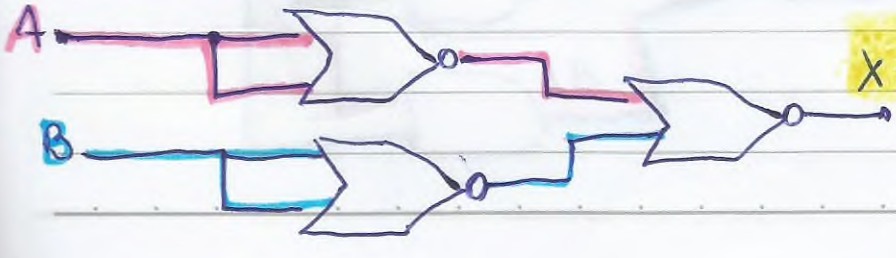
$X = \overline{A + A} = \overline{A}$

- Or



$X = A + B$

- And



$X = \overline{\overline{A} + \overline{B}} = AB$

Eletronica Digital
Circuitos Combinacionais
Soma dos produtos e Produto das Somas

X	Y	Z	F	
0	0	0	0	→ Soma S_1
0	0	1	1	Produto P_1
0	1	0	1	Produto P_2
0	1	1	1	Produto P_3
1	0	0	0	→ Soma S_2
1	0	1	1	Produto P_4
1	1	0	0	→ Soma S_3
1	1	1	1	Produto P_5

$$(P_1 + P_2 + P_3 + P_4 + P_5) = S_1 \cdot S_2 \cdot S_3$$

1. Soma de Produtos

$$F = \bar{X}\bar{Y}Z + \bar{X}Y\bar{Z} + \bar{X}YZ + X\bar{Y}Z + XYZ$$

2. Produto das Somas

$$F = (X + Y + Z) \cdot (\bar{X} + Y + Z)(\bar{X} + \bar{Y} + Z)$$

→ Simplificando a expressão de soma dos produtos

$$F = \bar{X}\bar{Y}Z + \bar{X}Y\bar{Z} + \bar{X}YZ + X\bar{Y}Z + XYZ$$
$$F = (\bar{X}\bar{Y}Z + \bar{X}YZ) + (\bar{X}Y\bar{Z} + \bar{X}YZ) + (X\bar{Y}Z + XYZ)$$
$$F = \bar{X}Z(\bar{Y} + Y) + \bar{X}Y(\bar{Z} + Z) + XZ(\bar{Y} + Y)$$
$$F = \bar{X}Z + \bar{X}Y + XZ$$
$$F = Z(X + \bar{X}) + \bar{X}Y$$
$$\boxed{F = Z + \bar{X}Y}$$

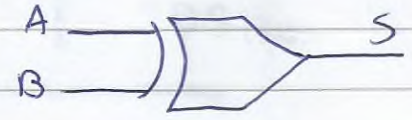
Eletrônica Digital
Ou exclusivo e Coincidência

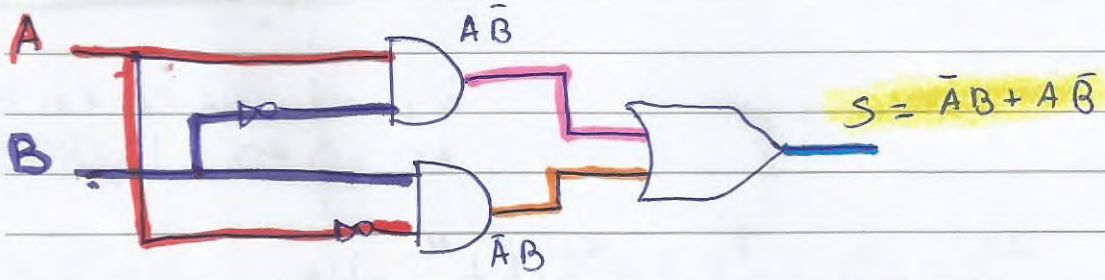
→ Ou exclusivo (função Xor)

A	B	S	
0	0	0	
0	1	1	$\bar{A}B$
1	0	1	$A\bar{B}$
1	1	0	

$S = \bar{A}B + A\bar{B}$

$S = A \oplus B$



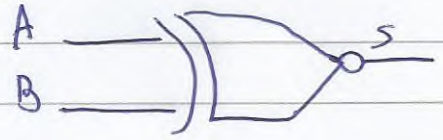


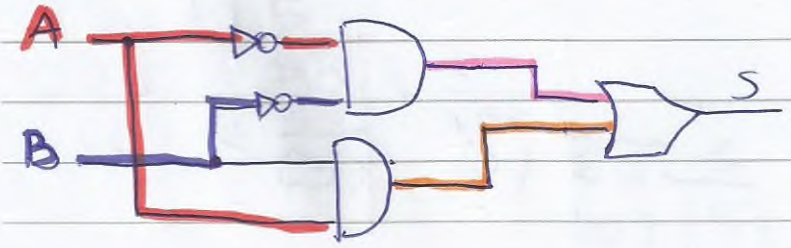
→ Coincidência (função XNor)

A	B	S	
0	0	1	$\bar{A}\bar{B}$
0	1	0	
1	0	0	
1	1	1	AB

$S = \bar{A}\bar{B} + AB$

$S = A \odot B$





Eletrônica Digital
Algebra booleana

Complementação

Se $A = 0$, então $\bar{A} = 1$; se $A = 1$, então $\bar{A} = 0$;

$\bar{\bar{A}} = A$

Postulados da Adição

$0 + 0 = 0$		$A + 0 = A$
$0 + 1 = 1$	$\Rightarrow$	$A + 1 = 1$
$1 + 0 = 1$		$A + A = A$
$1 + 1 = 1$		$A + \bar{A} = 1$

Postulados da Multiplicação

$0 \cdot 0 = 0$		$A \cdot 0 = 0$
$0 \cdot 1 = 0$	$\Rightarrow$	$A \cdot 1 = A$
$1 \cdot 0 = 0$		$A \cdot A = A$
$1 \cdot 1 = 1$		$A \cdot \bar{A} = 0$

Propriedade Associativa

$A + B + C = (A + B) + C$; $A \cdot B \cdot C = (AB)C$

Propriedade Comutativa

$A + B = B + A$; $A \cdot B = B \cdot A$

Propriedade distributiva

$A(B + C) = AB + AC$

Teorema de De Morgan

$\overline{A + B} = \bar{A} \cdot \bar{B}$

$\overline{A \cdot B} = \bar{A} + \bar{B}$

Identidades Auxiliares

$A + AB = A$

$A + \bar{A}B = A + B$

$(A + B)(A + C) = A + BC$

Eletrônica Digital

Mapa de Karnaugh - 2 variáveis

B	A	S1	S2	S3	S4
0	0	0	1	0	1
0	1	1	1	1	1
1	0	1	0	1	1
1	1	1	0	0	1

	A	$\bar{A}$
B	1	1
$\bar{B}$	1	0

$S1 = A + B$

	A	$\bar{A}$
B	0	0
$\bar{B}$	1	1

$S2 = \bar{B}$

	A	$\bar{A}$
B	0	1
$\bar{B}$	1	0

$S3 = \bar{A}B + A\bar{B}$

	A	$\bar{A}$
B	1	1
$\bar{B}$	1	1

$S4 = 1$

Mapa de Karnaugh - 3 variáveis

C	B	A	S1	S2	S3
0	0	0	0	1	0
0	0	1	1	1	1
0	1	0	1	1	0
0	1	1	1	1	0
1	0	0	0	0	1
1	0	1	0	0	1
1	1	0	1	0	1
1	1	1	1	0	1

	A		$\bar{A}$	
B	1	1	1	1
$\bar{B}$	1	0	0	0
	$\bar{C}$	C		$\bar{C}$

$S1 = B + A\bar{C}$

	A		$\bar{A}$	
B	1	0	0	1
$\bar{B}$	1	0	0	1
	$\bar{C}$	C		$\bar{C}$

$S2 = \bar{C}$

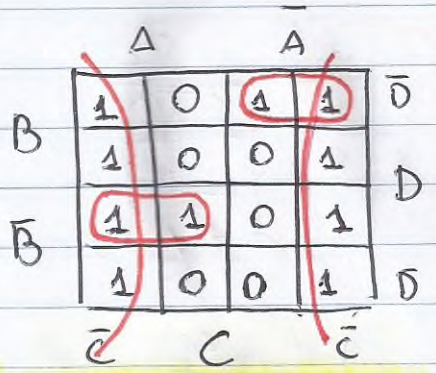
	A		$\bar{A}$	
B	0	1	1	0
$\bar{B}$	1	1	1	0
	$\bar{C}$	C		$\bar{C}$

$S3 = C + A\bar{B}$

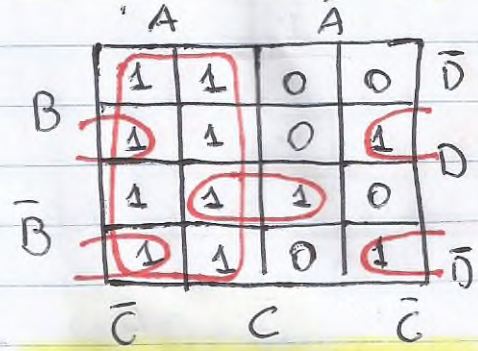
Eletrônica Digital

Mapa de Karnaugh - 4 variáveis

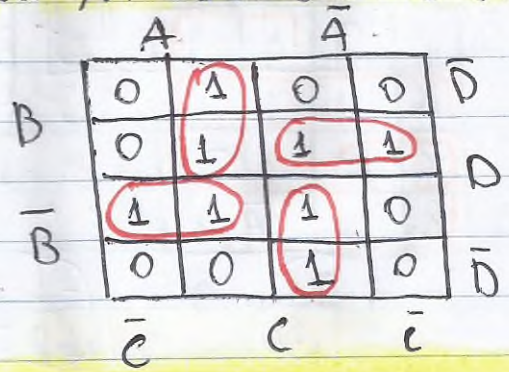
D	C	B	A	S_1	S_2	S_3	S_4
0	0	0	0	1	1	0	1
0	0	0	1	1	1	0	1
0	0	1	0	1	0	0	1
0	0	1	1	1	1	0	0
0	1	0	0	0	0	1	0
0	1	0	1	0	1	0	1
0	1	1	0	1	0	0	1
0	1	1	1	0	1	1	0
1	0	0	0	1	0	0	1
1	0	0	1	1	1	1	1
1	0	1	0	1	1	1	0
1	0	1	1	1	1	0	1
1	1	0	0	0	1	1	1
1	1	0	1	1	1	1	1
1	1	1	0	0	0	1	1
1	1	1	1	0	1	1	0



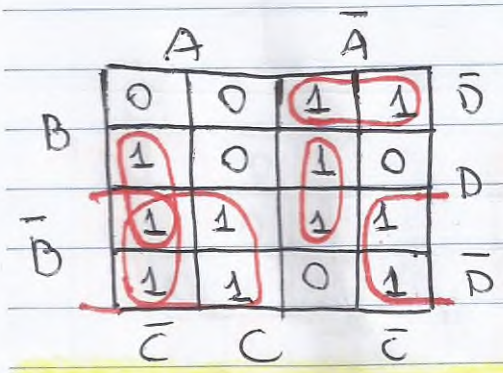
$S_1 = \bar{C} + A\bar{B}D + \bar{A}B\bar{D}$



$S_2 = A + BD\bar{C} + \bar{B}CD + \bar{B}\bar{C}\bar{D} + B\bar{C}D$



$S_3 = ABC + \bar{A}BD + \bar{A}\bar{B}C + A\bar{B}D$

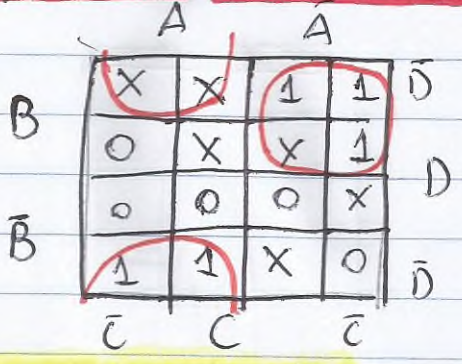


$S_4 = A\bar{B} + \bar{B}\bar{C} + A\bar{C}D + \bar{A}CD + \bar{A}B\bar{D}$

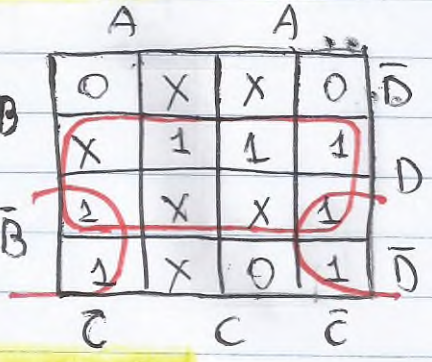
Eletrônica Digital

Mapa de Karnaugh - Variáveis irrelevantes

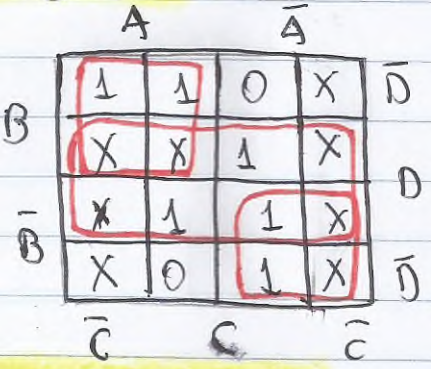
DCBA	S1	S2	S3	S4	S5	S6
0000	0	1	X	1	0	1
0001	1	1	X	0	X	1
0010	1	0	X	1	1	X
0011	X	0	1	1	X	X
0100	X	0	1	X	X	X
0101	1	X	0	1	1	X
0110	1	X	0	0	1	0
0111	X	X	1	1	X	0
1000	X	1	X	0	0	0
1001	0	1	X	1	X	1
1010	1	1	X	X	1	1
1011	0	X	X	X	X	0
1100	0	X	1	0	X	X
1101	0	X	1	0	X	X
1110	X	1	1	0	0	1
1111	X	1	X	1	1	1



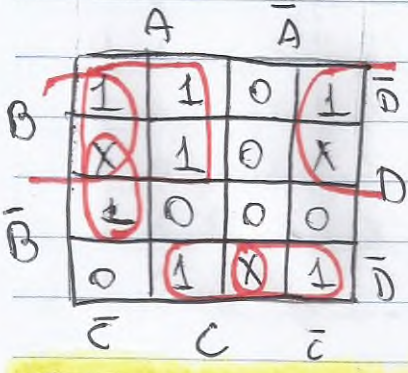
$S1 = \bar{A}B + A\bar{D}$



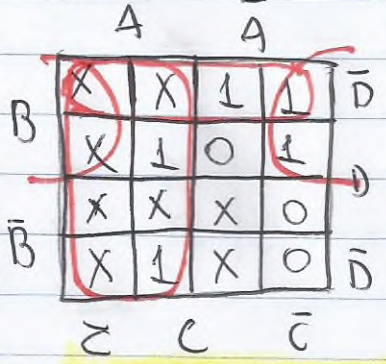
$S2 = D + \bar{B}\bar{C}$



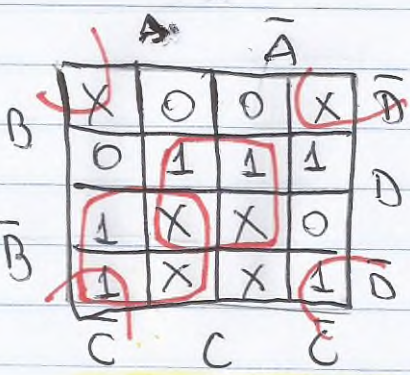
$S3 = D + AB + \bar{A}\bar{B}$



$S4 = AB + \bar{C}B + A\bar{C}D + \bar{A}\bar{B}\bar{D} + C\bar{B}\bar{D}$



$S5 = A + B\bar{D} + B\bar{C}$



$S6 = \bar{C}\bar{D} + A\bar{B} + CD$