Questão 01 – Defina Sistemas Digitais? Quais suas vantagens e desvantagens com relação aos sistemas analógicos?

É uma combinação de dispositivos projetados para manipular informação lógica ou quantidades físicas que são representadas no formato digital;

Sistemas Digitais	
Vantagens	**Desvantagens**
São mais fáceis de serem projetados;	Necessidade de converter sinais analógicos em digitais;
Fácil armazenamento de informação;	O processamento dos sinais digitalizados requer tempo;
* Maior exatidão e precisão;	
A operação pode ser programada;	
São menos afetados por ruído;	
CIs podem ser fabricados com mais circuitos internos;	

Decimal (base 10)	Binário (base 2)	Octal (base 8)	Hexadecimal (base 16)	Base *b* (4)
830385	11001010101110110001	3125661	CABB1	3022232301
20	10100	24	14	110
3,25	11,01	3,2	3,4	3,1
72	001001000	110	48	1020

1021

$20_{(10)} = b^2 + b^1 + 0.b^0 = 20$

$b_1 = 4, \quad b_2 = -5$

11,01

3,1

11001010101110110001

3022232301

20 = 10100 hello

110 001 001 000 = 001001001000

CABB1 : 1100 1010 1011 1011 0001

= 11001010101110110001

$11,01_{(2)} = 2^0 + 2^1 + 2^{-2} = 1 + 2 + 0,25 = 3,25_{(10)}$

1100 1010 1011 1011 0001 (2)

$1.2^{19} + 1.2^{18} + 0.2^{17} + 0.2^{16} + 1.2^{15} + 0.2^{14} + 1.2^{13} + 0.2^{12} + 1.2^{11} + 0.2^{10} + 1.2^9 + 1.2^8 + 1.2^7 + 0.2^6 + 1.2^5 + 1.2^4 + 0.2^3 + 0.2^2 + 0.2^1 + 1.2^0 = 524.288 + 262.144 + 32.768 + 8.192 + 2048 + 512 + 256 + 128 + 32 + 16 + 1 = 830.385_{(10)}$

$001001001_{(2)} = 2^0 + 2^3 + 2^6 = 1 + 8 + 64 = 73_{(10)}$

3 1 2 5 6 6 1 = 3125661 (8)

011001010101110110001

0001 0100 = 14 (16)

2 4 = 24 (6)

01001001 = 49 (16)

4 9

0011, 0100 = 3,4

3 4

3 2 = 3,2

(3) Porque o número 8 não existe na sequência octal (0,1,2,3,4,5,6,7)

(4)

a) 10101 × 11

10101
10101+
1111111

b) 100110 × 1010

110000

c) 110 | 10

10 | 11
010
10
00

d) 111,01 | 10,1

1110 1 | 1010
-1010 | 10,11100...
010010
-1010
010000
-1010
001100
1010
001000

e) 10110,1101 | 1,1000

10110 1101 | 11000
-11000 | 1111,001101
01011
-11000
01101
-11000
01010
-11000
00101
11000
00101000
-11000
01100000
-11000
00101000

0,1101 × 0,1011

1101
1101+
0000++
1101+++
0000++++
0,10001111

(5) a) 20/4 = 5 dígitos hexa

b) 2^{20} = 1048576

c) 00000 a FFFFF

6

a) (+30) = 0 0 0 1 1 1 1 0 → C1 → 1 1 1 0 0 0 0 1 → C2 → (−30) 1 1 1 1 0 0 0 1 0

(+15) = 0 0 0 0 1 1 1 1 → 1 1 1 1 0 0 0 0 → C2 → (−15) 1 1 1 1 0 0 0 0

1 1 1 0 1 0 0 1 0 + → 0 0 0 1 0 1 1 0 1 = 45

(1) negativo

↳ overflow

b) (+84) = 0 1 0 1 0 1 0 0

(+56) = 0 0 1 1 1 0 0 0

(1) 0 0 0 1 1 0 0

↳ overflow

c) −97 + 78

(+97) = 0 1 1 0 0 0 0 1 → C1 → 1 0 0 1 1 1 1 0 → C2 → 1 0 0 1 1 1 1 1

(+78) 0 1 0 0 1 1 1 0

+ 0 1 0 0 1 1 1 0

1 1 1 0 1 1 0 1

negativo

0 0 0 1 0 0 1 0

1 0 0 1 1

19

∴ −19

e) $75_{(8)} - 30_{(8)}$

$(+75)_{(8)}$ = 0 0 1 1 1 1 0 1 = $61_{(10)}$

$(+30)_{(8)}$ = 0 0 0 1 1 0 0 0 = $24_{(10)}$ → C1 → 1 1 1 0 0 1 1 1 → C2

1 0 0 1 1 1 0 1

1 1 1 0 1 0 0 0

(1) 0 0 1 0 0 1 0 1 → $37_{(10)}$ e 45(8)

↳ positivo

f) $-22_{(16)} - 1D_{(16)}$

0 0 1 0 0 0 1 0 = 34 → C1 → 1 1 0 1 1 1 0 1 → C2

0 0 0 1 1 1 0 1 = 29 1 1 1 0 0 0 1 0

1 1 1 0 1 1 1 0

1 1 1 0 0 0 1 1

(1) 1 1 0 0 0 0 0 1

↳ negativo

0 0 1 1 1 1 1 0

1

0 0 1 1 1 1 1 1

= 63(10)

− 3 F (16)

↳ Decimal

7

a) 0111 0100
0010 0011
1001 0111 (BCD)
↳ $97_{(10)}$

b) 0110 0010 0011
0101 1001 1001
1011 1011 1100
+ 0110 0110 0110
10010 00100010 (BCD)
$= 1222_{(10)}$

c) 0101 1000 1000 1000
0011 1001 1001
0101 1100 0010 0001
+ 0110 0110 0110
$= 6287$
0110 00101000 0111 (BCD)

8

a) 3E91 + 2F93 = 6E24

b) 91B − 6F2 = 1009

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

c) D191 + AAAB = 17C3C

d) FFFF − 2F93 = D06C + 1 = D06D

3E91 + D06D = 1OEFE = OEFE
↳ descarta

2F00 < 4000

FFFF − EF00 = 10FF + 1 = 100

FFFF + C000 = BFFF + 1 = C000

9

y = C
x = 4
z = 8

FFF FFF − 1E927Q = E16D8(F−Q) + 1 = E16D8(F−Q+1)

8 + (F−Q+1) = E
8 + 15 − Q + 1 = 14
Q = 10 → Q = A

4C7 PE8 + E16D8A = B

10

a) $5A_{(16)} = 90_{(10)}$ $B^2+3*B^1+2=90$

x = 8

b) $20_{(10)} = c^2 + c^1 + 0 \cdot c^0 = 20$

x = 4 , x = −5

11

a)	6D	→ 0110 1101	X
b)	A3	→ 1010 0011	→ Alterado – 2 – Escrita ✓ – Ñ protegido
c)	FB	→ 1111 1011	→ Alterado – 7 – Escrita X – Ñ protegido
d)	57	→ 0101 0111	→ Inalterado – 5 – Escrita ✓ – Protegido

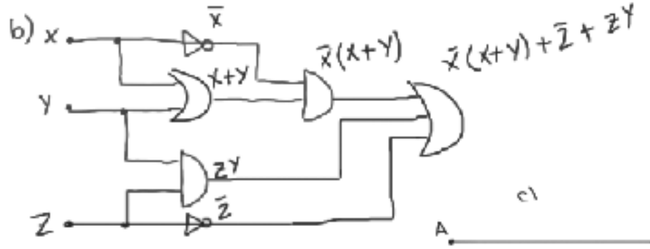
12

	a	b	c
	6 3 2 -1	7 3 1 -2	8 7 -4 -2
0	0 0 0 0	0 0 0 0	0 0 0 0
1	0 0 1 1	0 1 0 1	0 1 1 1
2	0 0 1 0	0 1 1 1	1 0 1 1
3	0 1 0 0	0 1 0 0	0 1 1 0
4	0 1 1 1	0 1 1 0	1 0 1 0
5	1 0 0 1	1 0 0 1	0 1 0 1
6	1 0 0 0	1 0 1 1	1 0 0 1
7	1 0 1 1	1 0 0 0	0 1 0 0
8	1 0 1 0	1 0 1 0	1 0 0 0
9	1 1 0 0	1 1 1 1	1 1 1 1

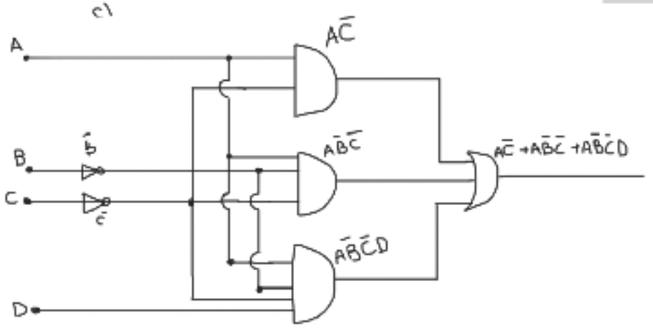
13

a)

b)



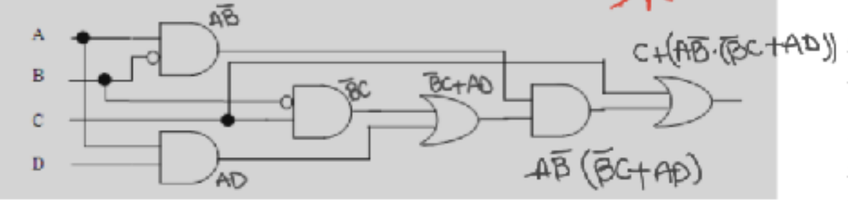
c)



14

	A	B	C	D	B+C	B	C	B+C	A(B +C)	a) A(B+C) + (B+C)	B+C	B+D	b) A(B+C)(B+D)	AC	AC	B C	c) AC + B C
0	0	0	0	0	0	1	1	1	0	0	1	1	0	0	1	1	1
1	0	0	0	1	0	1	1	1	0	0	1	1	0	0	1	1	1
2	0	0	1	0	1	1	0	1	0	0	0	1	0	0	1	0	1
3	0	0	1	1	1	1	0	1	0	0	0	1	0	0	1	0	1
4	0	1	0	0	1	0	1	1	0	0	1	0	0	0	1	0	1
5	0	1	0	1	1	0	1	1	0	0	1	1	0	0	1	0	1
6	0	1	1	0	1	0	0	0	0	0	1	0	0	0	1	0	1
7	0	1	1	1	1	0	0	0	0	0	1	1	0	0	1	0	1
8	1	0	0	0	0	1	1	1	1	0	1	1	1	0	1	1	1
9	1	0	0	1	0	1	1	1	1	0	1	1	1	0	1	1	1
10	1	0	1	0	1	1	0	1	1	1	0	1	0	1	0	0	0
11	1	0	1	1	1	1	0	1	1	1	0	1	0	1	0	0	0
12	1	1	0	0	1	0	1	1	1	1	1	0	0	0	1	0	1
13	1	1	0	1	1	0	1	1	1	1	1	1	1	0	1	0	1
14	1	1	1	0	1	0	0	0	0	0	1	0	0	1	0	0	0
15	1	1	1	1	1	0	0	0	0	0	1	1	1	1	0	0	0

Questão 15 - Dado o circuito lógico:



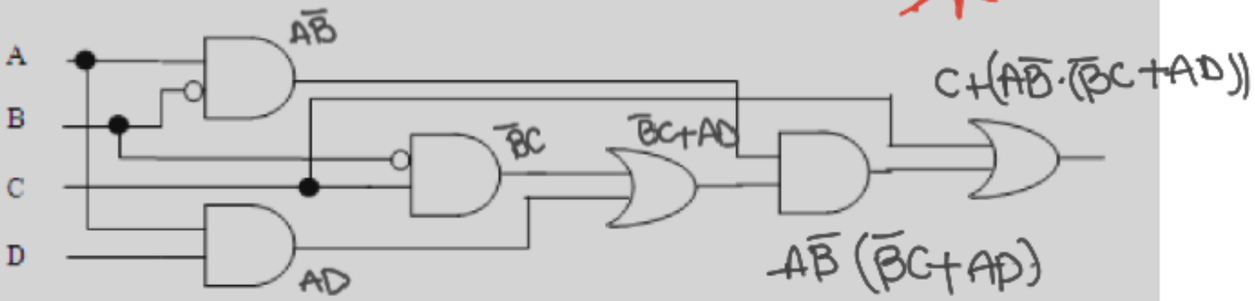
a) $C + A\bar{B}(\bar{B}C + AD)$

b)

	A	B	C	D	B	W AB	X BC	Y AD	Z X+Y	K W Z	C+K
0	0	0	0	0	1	0	0	0	0	0	0
1	0	0	0	1	1	0	0	0	0	0	0
2	0	0	1	0	1	0	1	0	1	0	1
3	0	0	1	1	1	0	1	0	1	0	1
4	0	1	0	0	0	0	0	0	0	0	0
5	0	1	0	1	0	0	0	0	0	0	0
6	0	1	1	0	0	0	0	0	0	0	1
7	0	1	1	1	0	0	0	0	0	0	1
8	1	0	0	0	1	1	0	0	0	0	0
9	1	0	0	1	1	1	0	1	1	1	1
10	1	0	1	0	1	1	1	0	1	1	1
11	1	0	1	1	1	1	1	1	1	1	1
12	1	1	0	0	0	0	0	0	0	0	0
13	1	1	0	1	0	0	0	1	1	0	0
14	1	1	1	0	0	0	0	0	0	0	1
15	1	1	1	1	0	0	0	1	1	0	1

c) 1

Questão 15 - Dado o circuito lógico:



a) Defina a expressão lógica de saída;

b) Apresente a tabela de verdade;

c) Qual o valor lógico da saída para a seguinte condição de entrada

A=D=0 e B=C=1;

a) $C + A\bar{B}(\bar{B}C + AD)$

	A	B	C	D	B+C	B	C	B+C	A(B +C)	a) A(B+C) + (B+C)	B+C	B+D	b) A(B+C)(B+D)	AC	AC	B C	c) AC + B C
0	0	0	0	0	0	1	1	1	0	0	1	1	0	0	1	1	1
1	0	0	0	1	0	1	1	1	0	0	1	1	0	0	1	1	1
2	0	0	1	0	1	1	0	1	0	0	0	1	0	0	1	0	1
3	0	0	1	1	1	1	0	1	0	0	0	1	0	0	1	0	1
4	0	1	0	0	1	0	1	1	0	0	1	0	0	0	1	0	1
5	0	1	0	1	1	0	1	1	0	0	1	1	0	0	1	0	1
6	0	1	1	0	1	0	0	0	0	0	1	0	0	0	1	0	1
7	0	1	1	1	1	0	0	0	0	0	1	1	0	0	1	0	1
8	1	0	0	0	0	1	1	1	1	0	1	1	1	0	1	1	1
9	1	0	0	1	0	1	1	1	1	0	1	1	1	0	1	1	1
10	1	0	1	0	1	1	0	1	1	1	0	1	0	1	0	0	0
11	1	0	1	1	1	1	0	1	1	1	0	1	0	1	0	0	0
12	1	1	0	0	1	0	1	1	1	1	1	0	0	0	1	0	1
13	1	1	0	1	1	0	1	1	1	1	1	1	1	0	1	0	1
14	1	1	1	0	1	0	0	0	0	0	1	0	0	1	0	0	0
15	1	1	1	1	1	0	0	0	0	0	1	1	1	1	0	0	0

b)

					W	X	Y	Z	K	
	A	B	C	D	$\bar{B}$	$A\bar{B}$	$\bar{B}C$	AD	X+Y	W Z	C+K
0	0	0	0	0	1	0	0	0	0	0	0
1	0	0	0	1	1	0	0	0	0	0	0
2	0	0	1	0	1	0	1	0	1	0	1
3	0	0	1	1	1	0	1	0	1	0	1
4	0	1	0	0	0	0	0	0	0	0	0
5	0	1	0	1	0	0	0	0	0	0	0
6	0	1	1	0	0	0	0	0	0	0	1
7	0	1	1	1	0	0	0	0	0	0	1
8	1	0	0	0	1	1	0	0	0	0	0
9	1	0	0	1	1	1	0	1	1	1	1
10	1	0	1	0	1	1	1	0	1	1	1
11	1	0	1	1	1	1	1	1	1	1	1
12	1	1	0	0	0	0	0	0	0	0	0
13	1	1	0	1	0	0	0	1	1	0	0
14	1	1	1	0	0	0	0	0	0	0	1
15	1	1	1	1	0	0	0	1	1	0	1

c) = 1

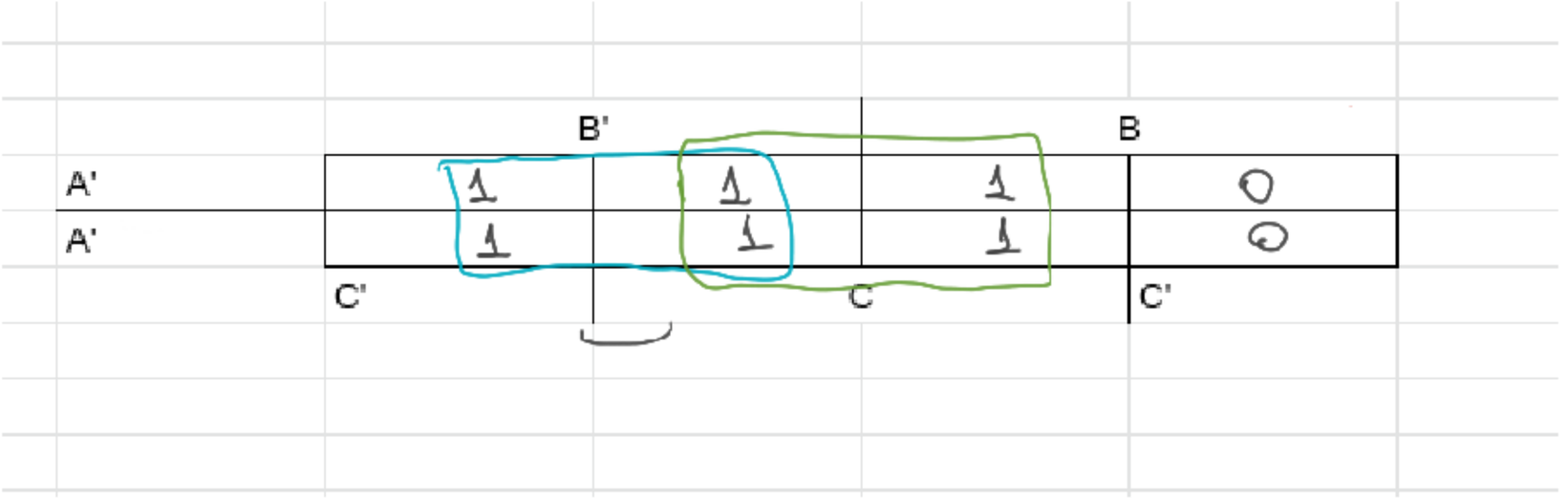
Questão 16 - Considere a seguinte tabela de verdade:

A	B	C	f(A, B, C)	$\overline{B}$
0	0	0	1	1
0	0	1	1	1
0	1	0	0	0
0	1	1	1	0
1	0	0	1	1
1	0	1	1	1
1	1	0	0	0
1	1	1	1	0

a) Escreva a expressão da função f(A, B, C);

b) Implemente o circuito lógico.

c) Simule esse circuito utilizando o software Circuit Maker;



$\overline{B} + C$

Questão 17 Através de manipulações algébricas, e utilizando os axiomas e os teoremas da álgebra de Boole binária que conhece, verifique as seguintes igualdades:

a) $(A+\overline{B}+AB)(A+\overline{B})\,\overline{A}B=0$; ✓
b) $\overline{A}B(\overline{D}+D\overline{C})+(A+D\overline{A}C)B=B$; ✓
c) $\overline{[(\overline{B}+C)A]+(\overline{CD})}=CD$.

a) $(A+\overline{B}+AB)(A+\overline{B})\,\overline{A}B$

$(A+\overline{B}+AB)(A\overline{A}\overline{B}^{\,0}+\overline{A}B\overline{B}^{\,0})$

$(A+\overline{B}+AB)(0)=0$

b) $\overline{A}B(\overline{D}+D\overline{C})+(A+D\overline{A}C)B=$

$\overline{A}B\overline{D}+\overline{A}B\overline{C}D+AB+\overline{A}BCD$

$(C+\overline{C})^{1}\overline{A}BD+AB+\overline{A}B\overline{D}$

$\overline{A}BD+AB+\overline{A}B\overline{D}$

$\overline{A}B(D+\overline{D})^{1}+AB \rightarrow B(\overline{A}+A)=B$

c) $\overline{\overline{[(\overline{B}+C)A]}+\overline{(C\overline{D})}}$

$\overline{[(\overline{B}+C)A]}\cdot\overline{C\overline{D}}$

$[\overline{(\overline{B}+C)}+\overline{A}]\cdot CD$

$(\overline{B}+C+\overline{A})\,CD$

$CD\overline{B}+CD+\overline{A}CD \rightarrow CD(\overline{B}+1+\overline{A})$

$=CD$

Questão 18 – Simplifique algebricamente:

a) $ABCD+ABC\overline{D}+\overline{A}BCD+\overline{A}B\overline{C}\,\overline{D}+\overline{A}\overline{B}CD+\overline{A}\overline{B}\overline{C}D$;
b) $\overline{X}+XY\overline{Z}+\overline{Y}$;
c) $XY+WXY\overline{Z}+\overline{X}Y$;
d) $\overline{X}\overline{Y}Z+YZ+XZ$.

a)

$ABCD+ABC\overline{D}+\overline{A}BCD+\overline{A}B\overline{C}\,\overline{D}+\overline{A}\overline{B}CD+\overline{A}\overline{B}\overline{C}D$

$ABC(D+\overline{D})^{1}+\overline{A}B\overline{D}(C+\overline{C})^{1}+\overline{A}\overline{B}D(C+\overline{C})^{1}$

$ABC+\overline{A}B\overline{D}+\overline{A}\overline{B}D \rightarrow ABC+\overline{A}D(B+\overline{B})^{1} \rightarrow ABC+\overline{A}D$

b) $\overline{x}+xy\overline{z}+\overline{y}$

$\overline{x}+y\overline{z}+\overline{y}$

$\overline{x}+\overline{z}+\overline{y}$

3º identidade
$A+\overline{A}B=A+B$ (2ºT / 1ºT)
$A+\overline{A}B=\overline{\overline{A+\overline{A}B}}=\overline{\overline{A}\cdot\overline{\overline{A}B}}=\overline{\overline{A}\cdot(\overline{\overline{A}}+\overline{B})}$
$=\overline{\overline{A}\cdot(A+\overline{B})}=\overline{\overline{A}A+\overline{A}\cdot\overline{B}}=\overline{\overline{A}\cdot\overline{B}}=A+B$

$\overline{A}+AB=\overline{A}+B$
$\overline{\overline{A}+AB}=\overline{\overline{A}\cdot\overline{AB}}=\overline{A\cdot(\overline{A}+\overline{B})}=\overline{A\overline{A}+A\cdot\overline{B}}$
$=\overline{A\cdot\overline{B}}=\overline{A}+B$

c) $XY+WXY\overline{Z}+\overline{X}Y$

$Y(X+WX\overline{Z}+\overline{X})^{1}$

$Y(1+WX\overline{Z})=Y$

d) $\overline{X}\overline{Y}Z+YZ+XZ$

$Z(\overline{X}\overline{Y}+Y+X)$

$Z(Y+\overline{X}+X)=Z$

$A+\overline{A}B$
$\overline{\overline{A+\overline{A}B}}=\overline{\overline{A}\cdot\overline{\overline{A}B}}=\overline{\overline{A}\cdot(\overline{\overline{A}}+\overline{B})}=$
$\overline{\overline{A}\cdot(A+\overline{B})}=\overline{\overline{A}A+\overline{A}B}=$
$\overline{\overline{A}B}=A+\overline{B}$

20

A	B	C	Z
0	0	0	0
0	0	1	1
0	1	1	0
0	1	0	1
1	1	0	0
1	1	1	1
1	0	1	0
1	0	0	1

$Z = \bar{A}\bar{B}C + \bar{A}B\bar{C} + ABC + A\bar{B}\bar{C}$

$= \bar{C}(\underbrace{\bar{A}B + A\bar{B}}_{A+B}) + C(\underbrace{\bar{A}\bar{B} + AB}_{\overline{A+B}})$

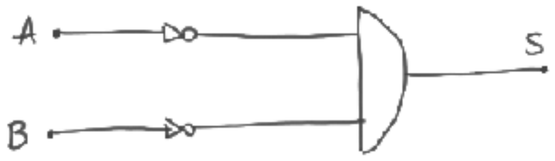
$= C \cdot (A+B) + C\overline{(A+B)}$

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

21

Sensor 4 bits $= 2^4 = 16$ possibilidades

45/15 = 3 steps



l	A	B	C	D	S
0	0	0	0	0	1
3	0	0	0	1	1
6	0	0	1	0	1
9	0	0	1	1	1
⋮					0
					⋮

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

$Z = \bar{A}\bar{B}\bar{C}(\bar{D}+D) + \bar{A}\bar{B}C(\bar{D}+D)$

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

$Z = \bar{A}\bar{B}(\bar{C}+C) = \boxed{\bar{A}\bar{B}}$

23

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

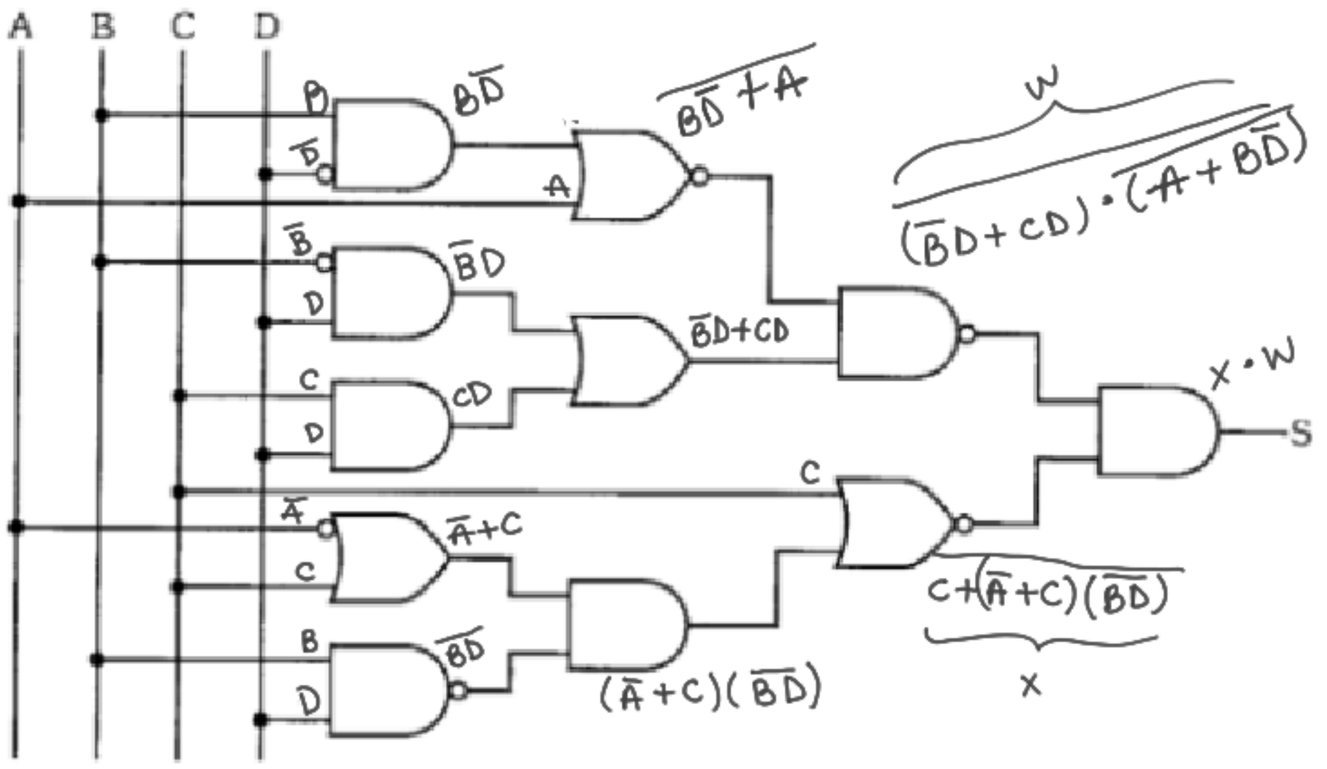
$\overline{\bar{A} \cdot (A + \bar{B})} = \overline{\bar{A}A + \bar{A}\bar{B}} = \overline{A\bar{B}} = \bar{\bar{A}} + \bar{B}$

$= A + B$

b) $AB + \bar{A}C + BC$

A	B	C	A_	AB	A_C	BC	AB+A_C	AB+A_C+BC
0	0	0	1	0	0	0	0	0
0	0	1	1	0	1	0	1	1
0	1	1	1	0	1	1	1	1
0	1	0	1	0	0	0	0	0
1	1	0	0	1	0	0	1	1
1	1	1	0	1	0	1	1	1
1	0	1	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0

Questão 22 - Considerando o circuito digital abaixo, determine: (a) a expressão lógica, (b) a tabela da verdade, (c) a expressão simplificada e o (d) conseqüente circuito digital somente com portas NÃO e OU de duas entradas.



$$S=\overline{\left[\overline{\left((\bar{A}+C)(\overline{B\bar{D}})\right)+C}\right]\left[\overline{(\bar{B}D+CD)\cdot(\overline{A+B\bar{D}})}\right]}$$

$$S=\left[\overline{\overline{(A+B\bar{D})\cdot(\bar{B}D+CD)}}\right]\left[\overline{C+\overline{(\bar{A}+C)(\overline{B\bar{D}})}}\right]$$

$$\left[(A+B\bar{D})+(\bar{B}D+CD)\right]\left[\bar{C}\cdot\overline{(\bar{A}+C)(\overline{B\bar{D}})}\right]$$

$$\left[A+B\bar{D}+(\overline{B\bar{D}}\cdot\overline{C\bar{D}})\right]\left[\bar{C}\cdot(\overline{\bar{A}+C})+(\overline{B\bar{D}})\right]$$

$$\left[(A+B\bar{D})+(B+\bar{D})\cdot(\bar{C}+\bar{D})\right]\left[\bar{C}\cdot(A\bar{C})+(BD)\right]$$

$$\left[A+\underline{B\bar{D}}+B\bar{C}+\underline{B\bar{D}}+\underline{\bar{D}\bar{C}}+\underline{\bar{D}\bar{D}}\right]\left[A\bar{C}\bar{C}+B\bar{C}D\right]$$

$$\left[A+B\bar{C}+\bar{D}(B+B+\bar{C}+1)\right]\left[A\bar{C}+B\bar{C}D\right]$$

$$\left[A+B\bar{C}+\bar{D}\right]\left[A\bar{C}+B\bar{C}D\right]$$

$$AA\bar{C}+AB\bar{C}D+A\bar{C}\bar{D}+B\bar{C}\cancel{B\bar{D}}^{0}+AB\bar{C}+BB\bar{C}\bar{C}D$$

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

$$\bar{C}\left(A+ABD+A\bar{D}+AB+BD\right)$$

$$\bar{C}\left(A(\underbrace{1}_{1}+BD+\bar{D}+B)+BD\right)\rightarrow\bar{C}\left(A+BD\right)$$

Questão 23: Demonstre a identidade de cada uma das seguintes equações lógicas:

a) $A+\overline{A}.B=A+B$

b) $A.B+\overline{A}.C+B.C=A.B+\overline{A}.C$

a) $A + \overline{A}.B = \overline{\overline{A + \overline{A}B}} = \overline{\overline{A} \cdot \overline{\overline{A}B}} = \overline{\overline{A} \cdot \overline{\overline{A}} + \overline{B}}$

$\overline{\overline{A} \cdot (A + \overline{B})} = \overline{\overline{A}A + \overline{A}\overline{B}} = \overline{A\overline{B}} = \overline{\overline{A}} + \overline{\overline{B}}$

$= A + B$

b) $AB + \overline{A}C + BC$

A	B	C	A_	AB	A_C	BC	AB+A_C	AB+A_C+BC
0	0	0	1	0	0	0	0	0
0	0	1	1	0	1	0	1	1
0	1	1	1	0	1	1	1	1
0	1	0	1	0	0	0	0	0
1	1	0	0	1	0	0	1	1
1	1	1	0	1	0	1	1	1
1	0	1	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0

Questão 24 – Considerando o circuito digital abaixo, determine:

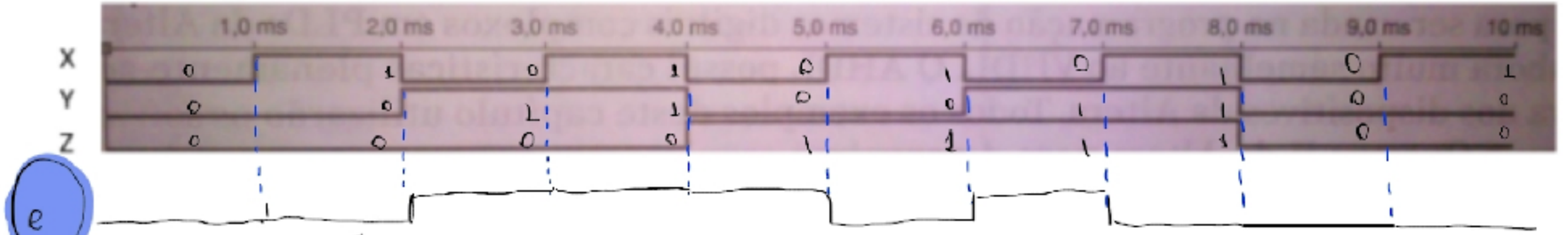
(a) a expressão lógica,

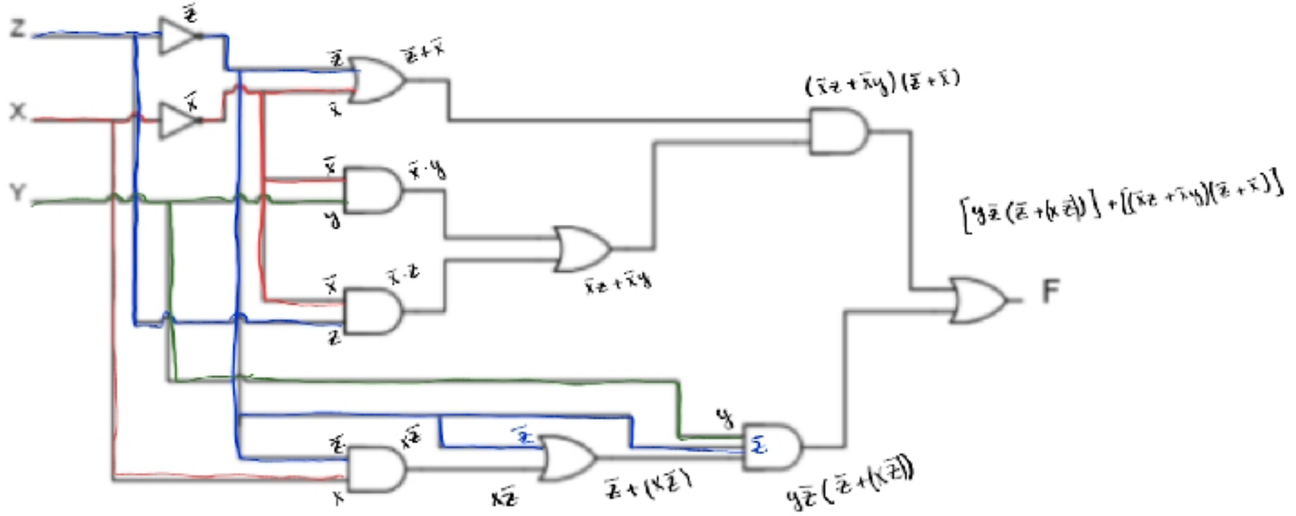
(b) a tabela da verdade,

(c) a expressão simplificada

(d) conseqüente circuito digital somente com portas NE (NAND) de duas entradas.

e) A forma de onda do sinal saída para as seguintes condições de entrada:





a)

$$[yz(\bar{z}+(x\bar{z}))]+[(\bar{x}z+\bar{x}y)(\bar{z}+\bar{x})]$$

$$[y\bar{z}(y\bar{z}\cdot\bar{z}(1+x))]+[\bar{x}z\bar{z}+\bar{x}\bar{x}z+\bar{x}yz+\bar{x}\bar{x}y]$$

$$[y\bar{z}(y\bar{z}\cdot\bar{z})]+[\bar{x}z+\bar{x}yz+\bar{x}y]$$

$$[y\bar{z}(\bar{z}(y+y))]+[\bar{x}(z+yz+y)]$$

$$[y\bar{z}]+[\bar{x}(z(\underbrace{1+y}_{1})+y)]$$

$$y\bar{z}+[\bar{x}(z+y)]$$

$$y\bar{z}+\bar{x}z+\bar{x}y\cdot 1 \quad \rightarrow = (z+\bar{z})$$

$$\bar{x}y(z+\bar{z})+y\bar{z}+\bar{x}z$$

$$\bar{x}yz+\bar{x}y\bar{z}+y\bar{z}+\bar{x}z$$

$$\bar{x}z(y+1)+y\bar{z}(\bar{x}+1)=\bar{x}z+y\bar{z}$$

b)

x	y	z	$\bar{x}$	$\bar{z}$	$\bar{x}z$	$y\bar{z}$	S
0	0	0	1	1	0	0	0
0	0	1	1	0	1	0	1
0	0	1	1	1	0	1	1
0	1	0	1	1	0	1	1
0	1	1	1	0	1	0	1
1	0	0	0	1	0	0	0
1	0	1	0	0	0	0	0
1	1	0	0	1	0	1	1
1	1	1	0	0	0	0	0