Prática 2

1

1.1

a) $x + x \cdot y = x$

x	y	$x + x \cdot y$
0	0	$0 + 0 = 0$
0	1	$0 + 0 = 0$
1	0	$1 + 1 \cdot 0 = 1$
1	1	$1 + 1 \cdot 1 = 1$

b) $x + \bar{x} y = x + y$

x	y	$x + y$	$x + \bar{x} y$
0	0	0	$0 + 0 = 0$
0	1	1	$0 + 1 = 1$
1	0	1	$1 + 0 = 1$
1	1	1	$1 + 0 = 1$

1.2

$$\underbrace{xyz + xy\bar{z}}_{\text{Adjacência}} + \underbrace{x\bar{y}z + x\bar{y}\bar{z}}_{\text{Adjacência}} + \bar{x}yz$$

$$= \underbrace{xy + x\bar{y}}_{\text{Adjacência}} + \bar{x}yz$$

$$= \underbrace{x + \bar{x}yz}_{\text{Simplificação}}$$

$$= x + yz$$

2

2.1

$x = 1, \; y = 0, \; z = 0$

a)

$$\overline{(1 \cdot 0 \cdot 0) + (1 \cdot 0 \cdot \bar{0}) + (\bar{1} \cdot \bar{0} \cdot \bar{0})}$$

$$= \overline{0 + 0 + 0} = \bar{0} = 1$$

b)

$$\overline{(1 \cdot 0 \cdot 0) \cdot (1 + 0 + \bar{0}) \cdot (\bar{1} + \bar{0} + \bar{0})}$$

$$= \overline{0 \cdot 0 \cdot 0} = \bar{0} = 1$$

c)

$$(1 \cdot 0 \cdot 0) \oplus (1 \cdot \bar{0} \cdot \bar{0}) \oplus (\bar{1} \cdot \bar{0} \cdot \bar{0})$$

$$= 0 \oplus 1 \oplus 0$$

$$= 1 \oplus 0$$

$$= 1$$

d)

$$(1 \cdot 0 \cdot 0 \cdot w) \oplus (1 \cdot \bar{0} \cdot \bar{0} \cdot \bar{w}) \oplus (1 \cdot \bar{0} \cdot \bar{0} \cdot w)$$

$$= 0 \oplus \bar{w} \oplus w$$

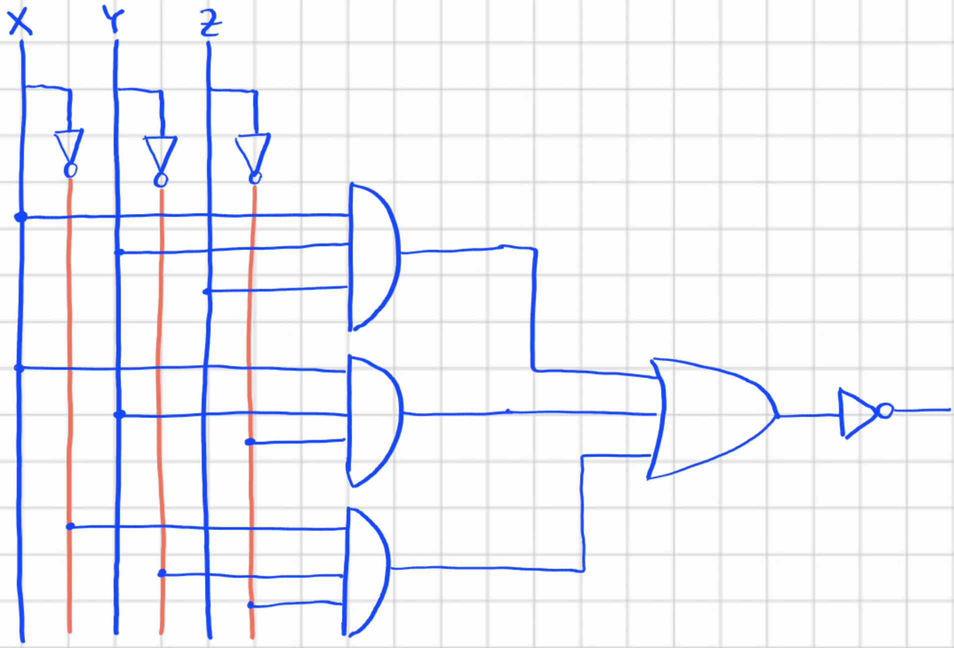
$$= \left((0\, w) + \bar{0}\,\bar{w}\right) \oplus w$$

$$= \bar{w} \oplus w$$

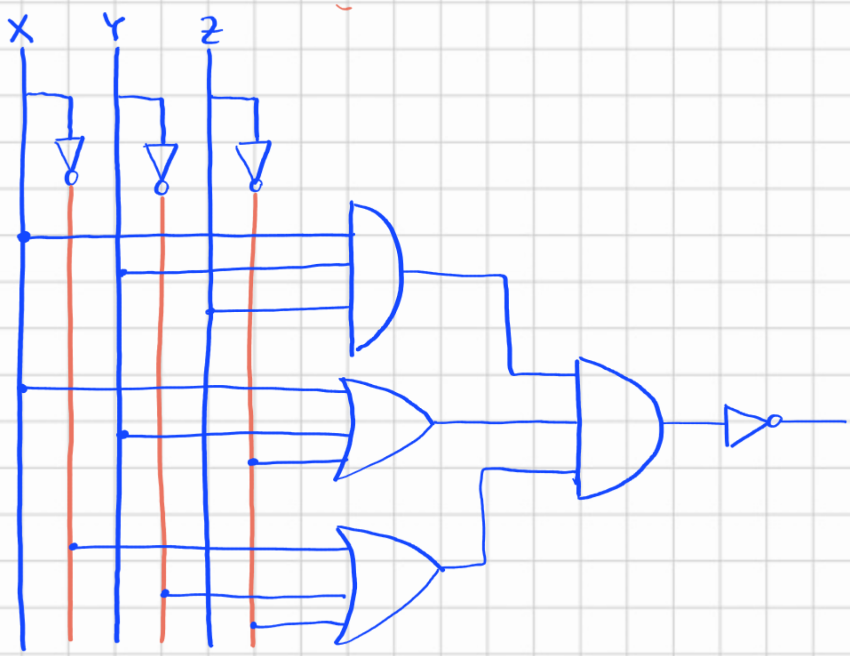
$$= 1$$

$\boxed{2.2}$

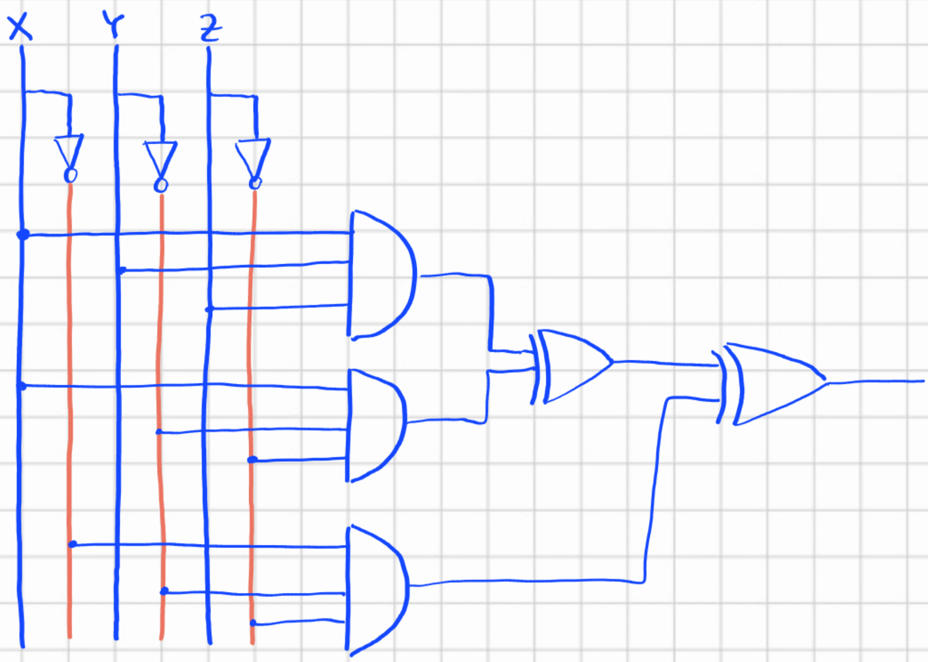
a)



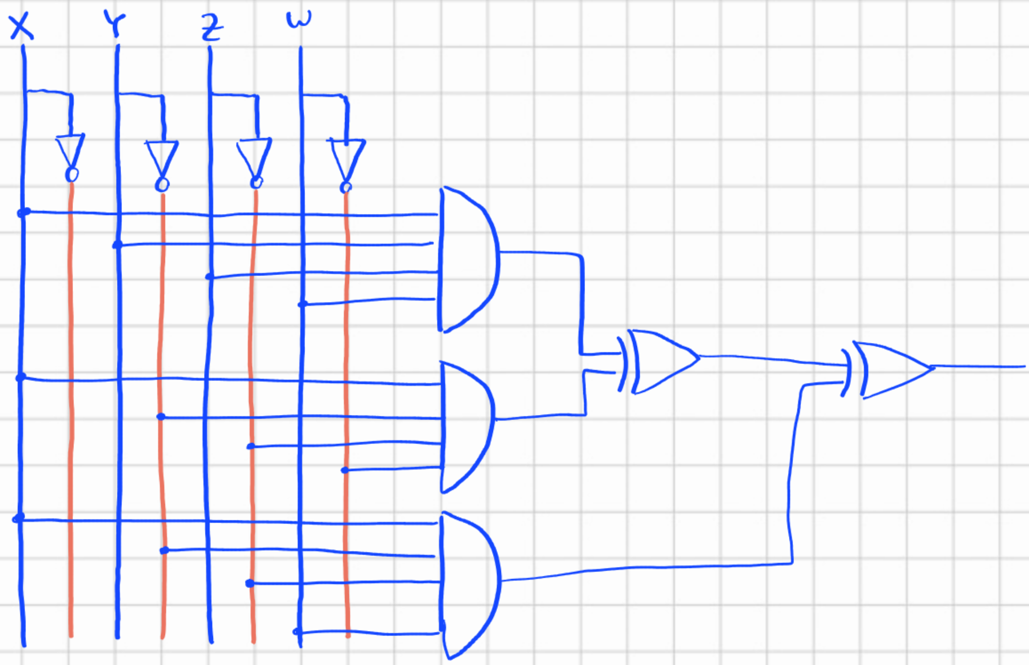
b)



c)



d)



3

3.1

x	y	z	h	w
0	0	0	0	1
0	0	1	1	0
0	1	0	1	0
0	1	1	1	0
1	0	0	1	1
1	0	1	1	1
1	1	0	1	0
1	1	1	0	1

1.ª FC $\Rightarrow$ SoP:

$$h(x,y,z) = \bar{x}\bar{y}z + \bar{x}y\bar{z} + \bar{x}yz + x\bar{y}\bar{z} + x\bar{y}z + xy\bar{z}$$

2.ª FC $\Rightarrow$ PoS:

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

—— // ——

1.ª FC $\Rightarrow$ SoP:

$$w(x,y,z) = \bar{x}\bar{y}\bar{z} + x\bar{y}\bar{z} + x\bar{y}z + xyz$$

2.ª FC $\Rightarrow$ PoS:

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

3.2

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

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

$$f(x,y,z) = \bar{x}\bar{y}\bar{z} + \bar{x}y\bar{z} + \bar{x}yz + x\bar{y}\bar{z} + x\bar{y}z + xy\bar{z}$$

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

4

$$y = x_1(x_2 + \bar{x}_3 \cdot x_4) + x_2 = x_1 x_2 + x_1 \bar{x}_3 x_4 + x_2$$

x_1	x_2	x_3	x_4	Y
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

4.1

$$\text{SoP} \Rightarrow y = \bar{x}_1 x_2 \bar{x}_3 \bar{x}_4 + \bar{x}_1 x_2 \bar{x}_3 x_4 + \bar{x}_1 x_2 x_3 \bar{x}_4 + \bar{x}_1 x_2 x_3 x_4 + x_1 \bar{x}_2 \bar{x}_3 x_4 + x_1 x_2 \bar{x}_3 \bar{x}_4 + x_1 x_2 \bar{x}_3 x_4 + x_1 x_2 x_3 \bar{x}_4 + x_1 x_2 x_3 x_4$$

$$\Leftrightarrow y = \overline{\overline{\bar{x}_1 x_2 \bar{x}_3 \bar{x}_4} \cdot \overline{\bar{x}_1 x_2 \bar{x}_3 x_4} \cdot \overline{\bar{x}_1 x_2 x_3 \bar{x}_4} \cdot \overline{\bar{x}_1 x_2 x_3 x_4} \cdot \overline{x_1 \bar{x}_2 \bar{x}_3 x_4} \cdot \overline{x_1 x_2 \bar{x}_3 \bar{x}_4} \cdot \overline{x_1 x_2 \bar{x}_3 x_4} \cdot \overline{x_1 x_2 x_3 \bar{x}_4} \cdot \overline{x_1 x_2 x_3 x_4}}$$

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

4.2

$$\text{PoS} \Rightarrow \overline{\overline{(x_1 + x_2 + x_3 + x_4)} + \overline{(x_1 + x_2 + x_3 + \bar{x}_4)} + \overline{(x_1 + x_2 + \bar{x}_3 + x_4)} + \overline{(x_1 + x_2 + \bar{x}_3 + \bar{x}_4)} + \overline{(\bar{x}_1 + x_2 + x_3 + x_4)} + \overline{(\bar{x}_1 + x_2 + \bar{x}_3 + x_4)} + \overline{(\bar{x}_1 + x_2 + \bar{x}_3 + \bar{x}_4)}}$$

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

5

5.1

$$\underbrace{xyz + xy\bar{z}}_{\text{Adjacência}} + \underbrace{x\bar{y}z + x\bar{y}\bar{z}}_{\text{Adjacência}}$$

$$= \underbrace{xy + x\bar{y}}_{\text{Adjacência}}$$

$$= x$$

5.2

$$\overline{\overline{xy} + x\bar{y} + \bar{x}y}$$

De Morgan

$$= \underbrace{\overline{\overline{xy}}}_{\text{Involução}} \cdot \overline{x\bar{y}} \cdot \overline{\bar{x}y}$$

De Morgan

$$= xy \cdot \left((\bar{x} + \underbrace{\bar{\bar{y}}) \cdot (\bar{\bar{x}}}_{\text{Involução}} + \bar{y})\right)$$

$$= \underbrace{xy}_{\text{comutatividade}} \cdot \left((\bar{x} + y)(x + \bar{y})\right)$$

$$= \underbrace{yx \cdot (\bar{x} + y)}_{\text{Simplificação}} \cdot \underbrace{(x + \bar{y})}_{\text{comut.}}$$

$$= yx \cdot y \cdot (\bar{y} + x)$$

comutativid. + indempotência

$$= \underbrace{xy(\bar{y} + x)}_{\text{simplificação}}$$

$$= \underbrace{xxy}_{\text{Indempotência}} = xy$$

$\boxed{5.3}$

Provar que: $\boxed{x \oplus y \oplus w = (x \oplus y) \oplus w = x \oplus (y \oplus w)}$

$$x \oplus y \oplus w = (\bar{x} y + x \bar{y}) \oplus w = (\bar{x} y + x \bar{y}) \bar{w} + \overline{(\bar{x} y + x \bar{y})} w$$

Distribut.

$$= \bar{w} \bar{x} y + \bar{w} x \bar{y} + (\overline{x \oplus y}) w$$

$$= \bar{w} \bar{x} y + \bar{w} x \bar{y} + (x y + \bar{x} \bar{y}) w$$

Distribut.

$$= \bar{w} \bar{x} y + \bar{w} x \bar{y} + w x y + w \bar{x} \bar{y}$$

Comutat.

$$= \bar{x} \bar{w} y + \bar{x} w \bar{y} + x w y + x \bar{w} \bar{y}$$

Distribut.

$$= \bar{x} (\underbrace{\bar{w} y + w \bar{y}}_{w \oplus y}) + x (\underbrace{w y + \bar{w} \bar{y}}_{(\overline{w \oplus y})})$$

Comut.

$$= \underbrace{(w \oplus y)}_{A} \underbrace{\bar{x}}_{\bar{B}} + \underbrace{\overline{(w \oplus y)}}_{\bar{A}} \underbrace{x}_{B} \Longrightarrow A \bar{B} + \bar{A} B = A \oplus B$$

$$= (w \oplus y) \oplus x$$