3.2- Ejercicios propuestos:

10) a) $F(A,B,C,D,E) = A.B.\overline{C} + \overline{C}.\overline{D}.E + A.B + A.B.\overline{C}.\overline{D}.E + A.B.D.\overline{E} + \overline{C}.D.E =$

$= A.B(\overline{C} + 1 + \overline{C}.D.E + D.\overline{E}) + \overline{C}.E(\overline{D} + D) =$

$= A.B(1) + \overline{C}.E(1) = A.B + \overline{C}.E$

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

$= \overline{A}.A + \overline{A}.\overline{C} = 0 + \overline{A}.\overline{C} = \overline{A}.\overline{C}$

c) $G(A,B,C) = A.B.\overline{C} + A.\overline{B}.C + A.\overline{B}.\overline{C} = A.(B.\overline{C} + \overline{B}.C + \overline{B}.\overline{C}) =$

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

d) $F(A,B,C,D) = \overline{B}.C.\overline{D} + \overline{A}.(\overline{C + B}) + A.C\overline{D} + A.\overline{B}.C.D =$

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

$= \overline{B}.C + A.C.\overline{D}$

e) $F(W,X,Y,Z) = \overline{W}.(\overline{X} + \overline{Y.(Z + W)}) = W + (\overline{X + Y.(Z + W)}) =$

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

$= W + X.\overline{Y} + X\overline{Z}$

f) $F(A,B,C,D) = \overline{A}.B.C + \overline{B}.C.D + \overline{A}.\overline{B}.C.\overline{D} + A.B.C.D =$

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

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

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

$W=0 \vee X=0 \quad Y=1 \; Z=1$

11) a)

A	B	C	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

b)

X	Y	Z	G
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

c)

X	Y	Z	W	F
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
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

$T \to A.\overline{B} \quad A=1 \wedge B=0 \qquad F \to X + \overline{Z} \quad X=0 \; Z=1$

$T \to \overline{A}.\overline{C} \quad A=0 \wedge C=0 \qquad F \to \overline{X} + \overline{Y} + Z \quad X=1 \; Y=1 \; Z=0$

(12) a)

X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

$X.\overline{Y} + X.Y.\overline{Z} + \overline{X}.Z$

↳ é falso quando:

$X=0 \vee Y=1$

$X=0 \vee \hat{Y}=0 \vee Z=1$

$X=1 \vee \hat{Z}=0$

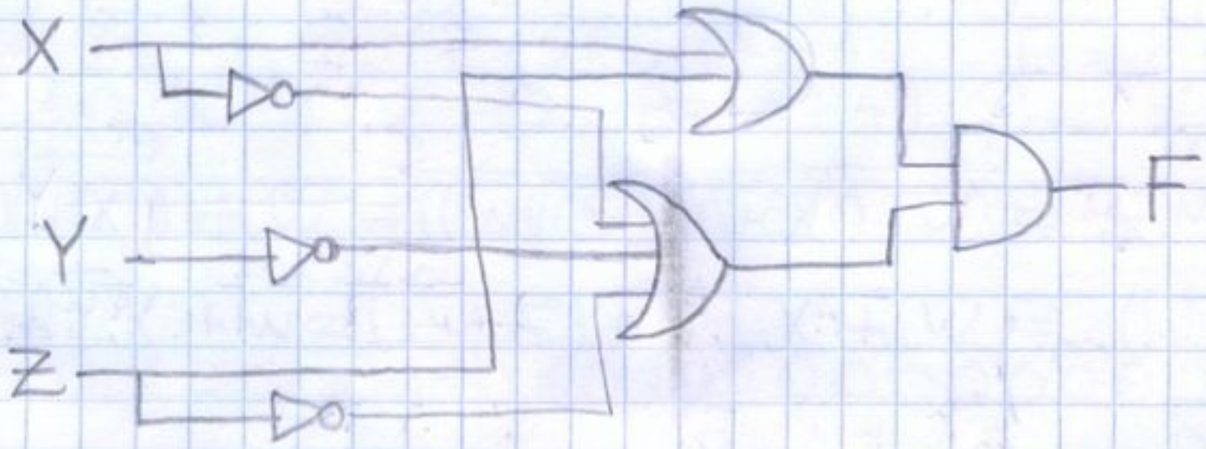
b) $F(X,Y,Z) = X.\overline{Y} + X.Y.\overline{Z} + \overline{X}.Z = X.(\overline{Y} + Y\overline{Z}) + \overline{X}.Z =$

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

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

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

c)



(13) a) $(A+B)+(B.C) = A+(B+B.C) = A+B\overbrace{(1+C)}^{1} = A+B$ c.q.p

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

$= \overline{C}+\overline{B}(1+A) = \overline{C}+\overline{B}$ c.q.p.

(14) a) $F(A,B,C) = \overline{A+\overline{B+\overline{C}}} + \overline{\overline{A}.B.C} = \overline{A}.B+\overline{C}+\overline{A}.B+\overline{C} =$

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

b)

A	B	C	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

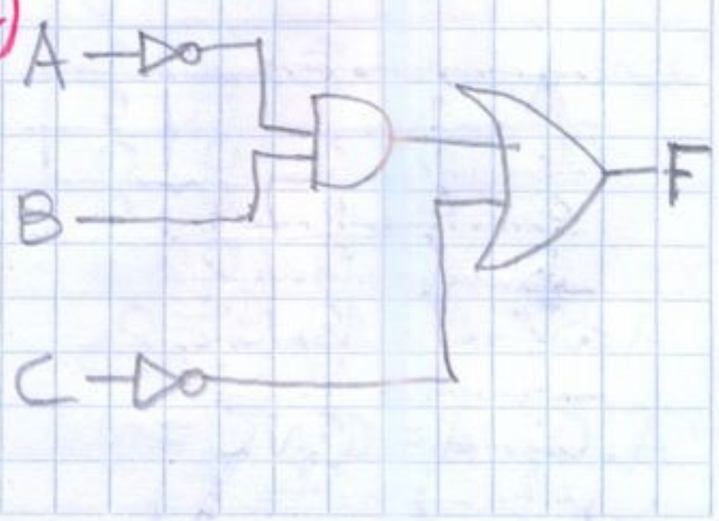
$\overline{A}.B+\overline{C}$

↳ é falso quando:

$C=1$

$\left(\hat{A}=1 \Rightarrow B=0\right)$

c)



15) a)

X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

$F = \overline{X}.Y + \overline{X}.\overline{Y}.Z$

F é falso quando:

$X = 1 \vee Y = 0$ $\quad F = \overline{X}.(Y+Z)$

$\wedge$

$X = 1 \vee Y = 1 \vee Z = 0$

b)

A	B	C	D	G
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
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

G é verdadeiro quando:

$A = 0 \vee B = 1 \vee C = 1$

$\wedge$

$A = 1 \vee B = 0 \vee D = 0$

$\wedge$

$B = 1 \vee C = 0 \vee D = 0$

$\wedge$

$A = 1 \vee B = 1 \vee C = 1 \vee D = 1$

$G = \overline{A}.B.\overline{C}.D + \overline{A}.\overline{B}.C.\overline{D} + \overline{A}.B.\overline{C}.\overline{D} + \overline{A}.B.C.\overline{D} +$

$+ A.\overline{B}.C.\overline{D} + A.B$

16)

A	B	C	G
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

G é falsa quando:

$A = 0 \vee C = 1$

$\wedge$

$B = 1 \vee A = 0 \vee C = 0$

$\wedge$

$B = 0 \vee C = 0 \vee A = 1$

$(A+B+C).(A+B+\overline{C}).(A+\overline{B}+C).(\overline{A}+B+C).$
$.(\overline{A}+\overline{B}+C)$

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

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

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

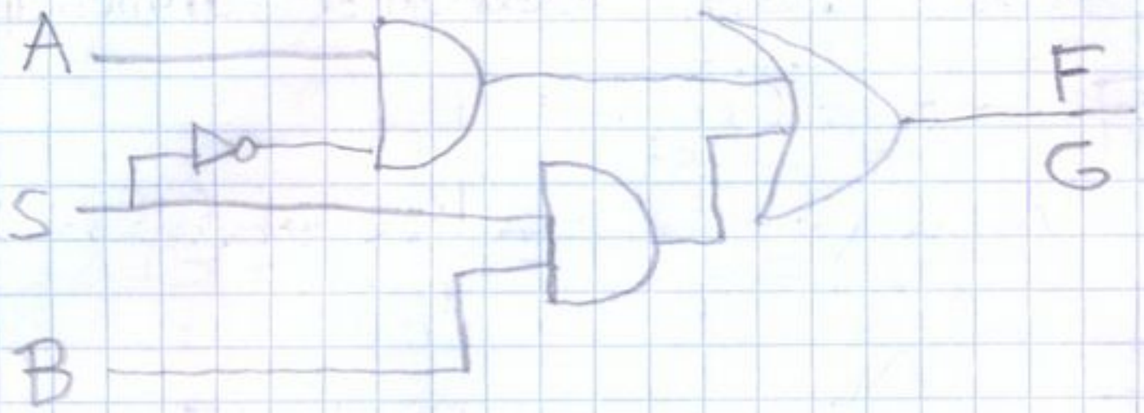
17)

A	B	S	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

a)

b) $F(A,B,S) = A.\overline{S} + B.S$

c)



d) $A = X.Y \quad B = X+Y \quad G = X.Y.\overline{S} + (X+Y).S =$

$= X.Y.\overline{S} + X.S + Y.S = X.(Y.\overline{S} + S) + Y.S = X.(S+Y) + Y.S =$

$= X.S + X.Y + Y.S$

e) $\overline{\overline{S.X}} . (\overline{S}.X.Y) . \overline{S.Y} = S.X + (\overline{S}.X.Y) + S.Y = S.X + S.Y + S + \overline{X} + \overline{Y} =$

$= S(X+Y+1) + \overline{X} + \overline{Y} = S + \overline{X} + \overline{Y}$

(18) a)

A_3	A_2	A_1	A_0	S
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

b) $S = A_3.\overline{A_2}.\overline{A_1}.\overline{A_0} + A_3.A_2.\overline{A_1}.\overline{A_0} =$

$= \overline{A_1}.\overline{A_0}(A_3.\overline{A_2} + A_3.A_2) =$

$= \overline{A_1}.\overline{A_0}(A_3.(\overline{A_2} + A_2)) =$

$= \overline{A_1}.\overline{A_0}.A_3$

* Segundo o exemplo de b):

$S = \overline{A}.\overline{B}.C_i + \overline{A}.B.\overline{C_i} + A.\overline{B}\,\overline{C_i} + AB.C_i =$

$= \overline{A}.(\overline{B}.C_i + B.\overline{C_i}) + A.(\overline{B}.\overline{C_i} + B.C_i) =$

$= \overline{A}.((\overline{B} + B.\overline{C_i}).(C_i + (B.\overline{C_i})) + A.((\overline{B} + B.C_i).(\overline{C_i} + B$

$= \overline{A}.((\overline{B} + \overline{C_i}).(C_i + B))$

(19) a)

A	B	C_i	S	C_o
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

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

$C_o = \overline{A}.B.C_i + A.\overline{B}.C_i + A.B.\overline{C_i} + A.B.C_i$

c) $S = (A \oplus B) \oplus C_i = (\overline{A}B + A\overline{B}) \oplus C_i =$

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

$= (A\overline{B}.\overline{A}B.C_i) + \overline{A}B.(1+C_i) =$

$= (A\overline{B}.\overline{A\overline{B}}.C_i) + \overline{A}B = \overline{A}B$ *

$C_o = A.C_i + B.C_i + A.B$ Desenvolvendo a expressão do [illegible] b)

$C_o = \overline{A}.B.C_i + A.\overline{B}.C_i + A.B.\overline{C_i} + A.B.C_i =$

$= C_i(\overline{A}B + A.\overline{B}) + A.B(\overline{C_i} + C_i) = \overline{A}.B.C_i + A.\overline{B}.C_i + A.B =$

$= \overline{A}.B.C_i + A.(\overline{B}.C_i + B) = \overline{A}.B.C_i + A.(B + C_i) =$

$= \overline{A}.B.C_i + A.B + A.C_i = B.(\overline{A}.C_i + A) + A.C_i = B.(A + C_i) + A.C_i =$

$= A.C_i + B.C_i + A.B$ c.q.p.

d) $C_i = 0$; $S_0 = 0$; $w_1 = 0$; $S_1 = 0$; $w_2 = 1$; $S_2 = 0$; $w_3 = 1$; $S_3 = 1$; $C_o = 1$

(20) a)

A_1	A_0	B_1	B_0	MAIOR
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	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
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	0

b) $MAIOR(A_1, A_0, B_1, B_0) =$

$= \overline{A_1}.A_0.\overline{B_1}.\overline{B_0} + A_1.\overline{A_0}.\overline{B_1}.\overline{B_0} +$

$+ \overline{A_1}.A_0.B_1.\overline{B_0} + A_1.A_0.\overline{B_1}.\overline{B_0} +$

$+ A_1.A_0.\overline{B_1}.B_0 + A_1.A_0.B_1.\overline{B_0} =$

$= \overline{A_1}.A_0.\overline{B_0}.(\overline{B_1} + B_1) + A_1.\overline{B_1}.\overline{B_0}.(\overline{A_0} + A_0) +$

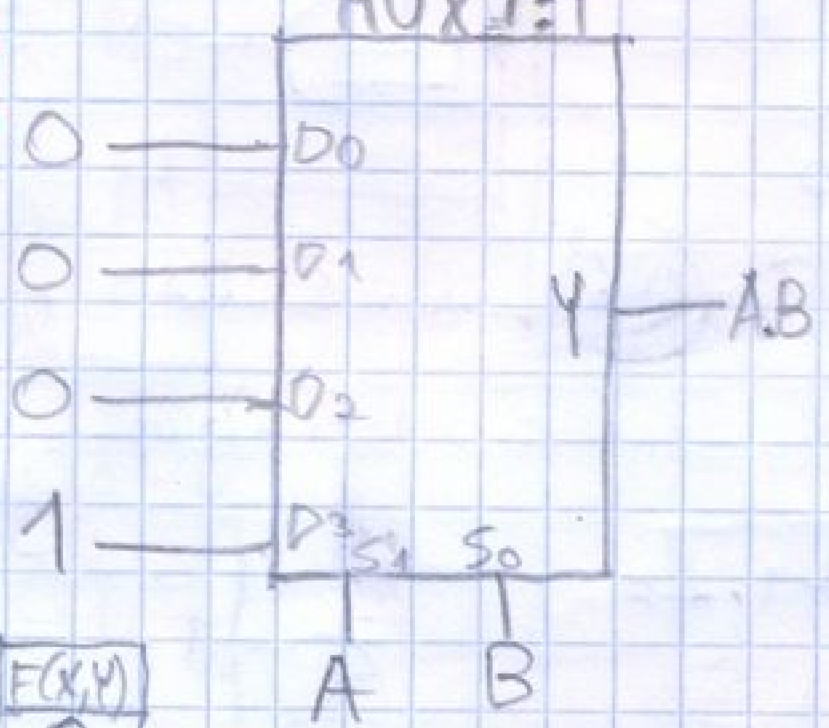
$+ A_1.A_0.(\overline{B_1}.B_0 + B_1.\overline{B_0}) =$

$= \overline{B_0}(\overline{A_1}.A_0 + A_1\overline{B_1}) + A_1.A_0(B_1 + B_0).(\overline{B_1} + \overline{B_0})$

$= \overline{B_0}(A_1 + A_0).(\overline{B_1} + \overline{A_1})$

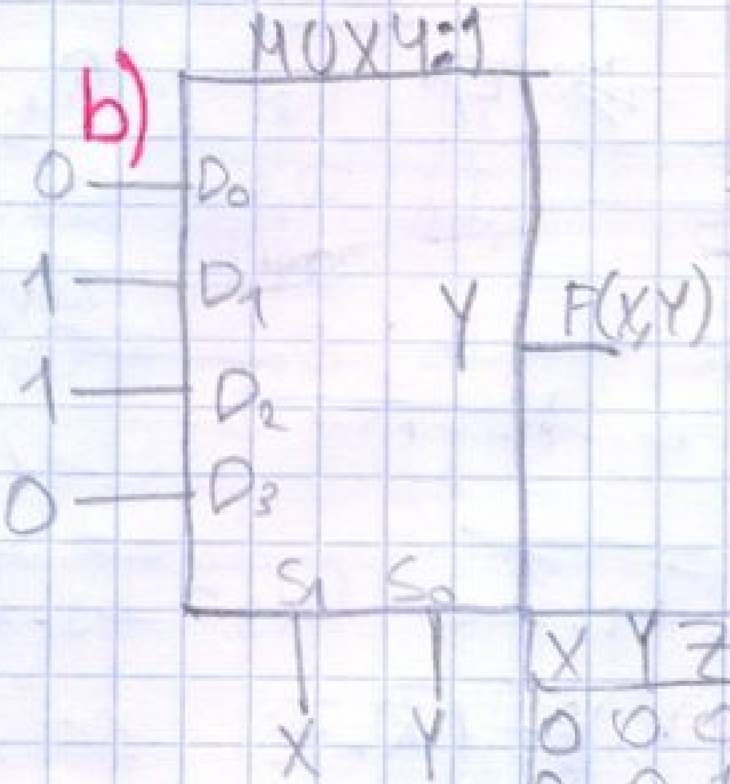
(21) Este circuito determina o máximo de A e B (A se A>B e B se A≤B)

(22) a)



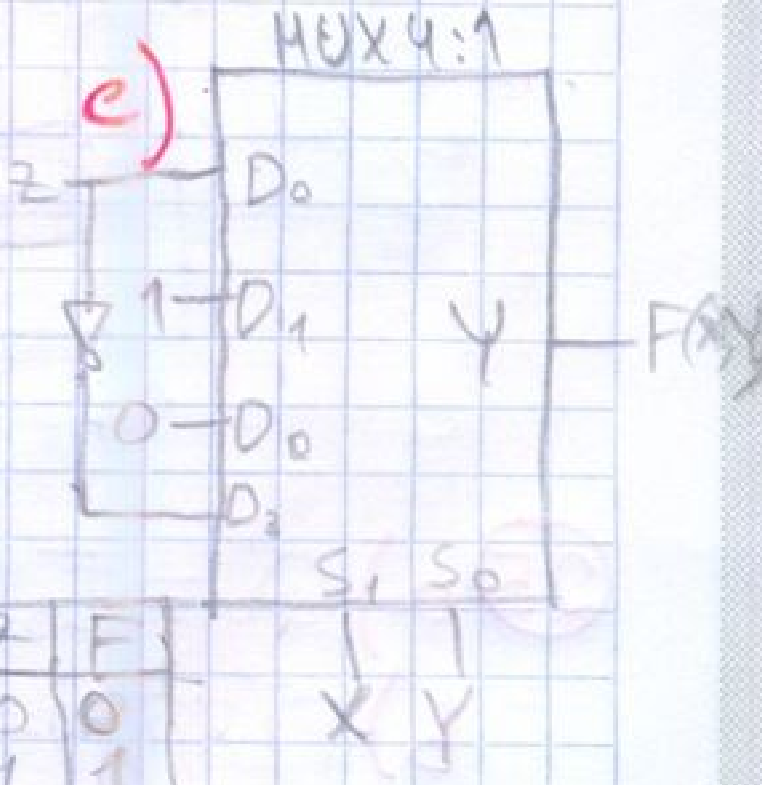
X	Y	F(X,Y)
0	0	0
0	1	1
1	0	1
1	1	0

b)



X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

c)

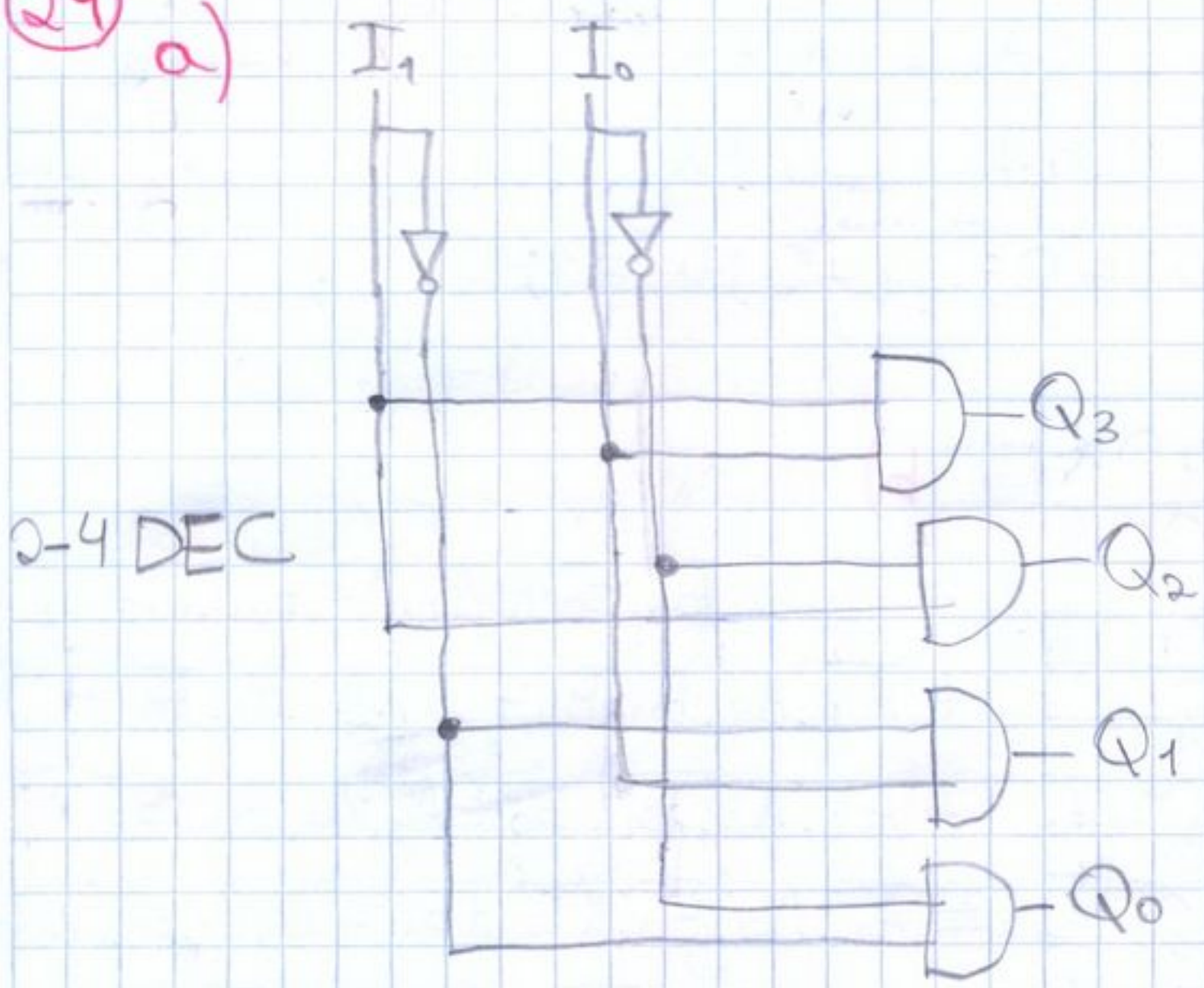


(23) a) Se AB=01, $L_{V_m}=0$, $L_{E_s}=1$, $L_W=0$

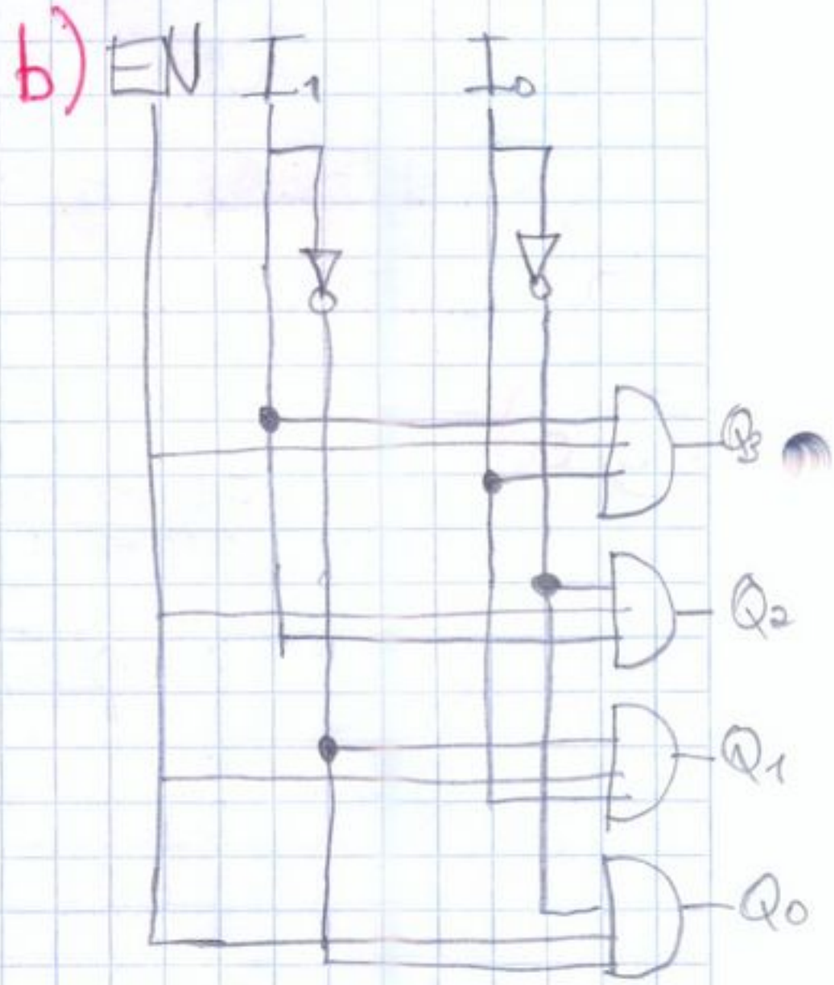
Se AB=11, todos as lâmpadas estão desligadas.

b) É impossível ter simultaneamente duas saídas de um descodificador ativas.

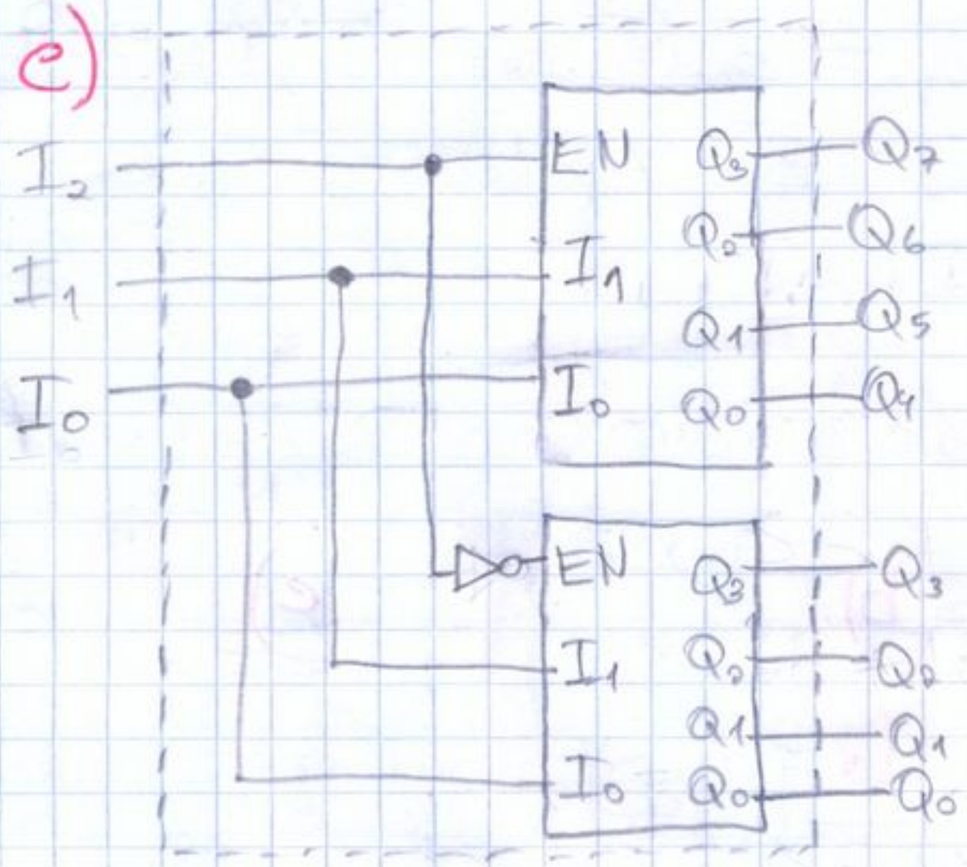
(24) a)



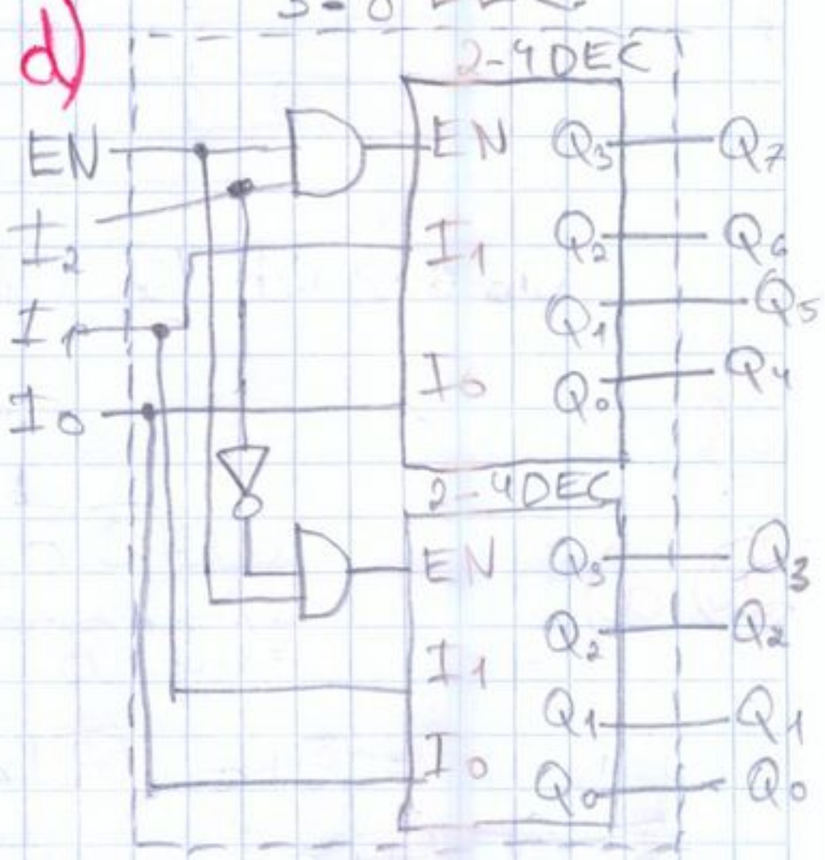
b)



c)



d)



(25) a) $Q_0=\overline{I_2}.\overline{I_1}.\overline{I_0}$ $Q_3=\overline{I_2}.I_1.I_0$

b) $F(X,Y,Z)=X.Y.\overline{Z}+\overline{X}.Z$

É falso quando: $X=0 \vee Y=0 \vee Z=1$

$X=1 \vee Z=0$