

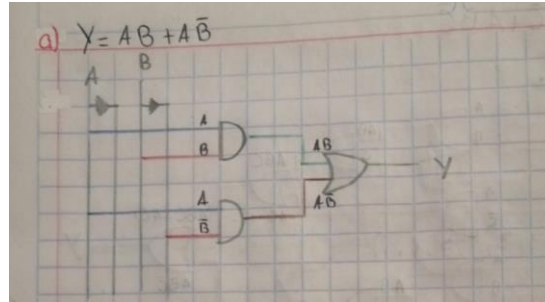
Práctica 8: Algebra de Boole

Nombre: Colín Ramiro Joel

No. de lista: 3

a) $Y = AB + A\bar{B}$

- Circuito lógico



- Simplificación

a) $AB + A\bar{B} = A$

$$\begin{aligned} A(B + \bar{B}) &= A \cdot 1 = A \\ A(B + A) \cdot (B + \bar{B}) &= A(B + A) \cdot 1 = A(B + A) = A \end{aligned}$$

Handwritten simplification steps for $AB + A\bar{B}$:

- $A(B + \bar{B}) = A \cdot 1 = A$
- $A(B + A) \cdot (B + \bar{B}) = A(B + A) \cdot 1 = A(B + A) = A$

Handwritten laws used:

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

- Tablas de verdad

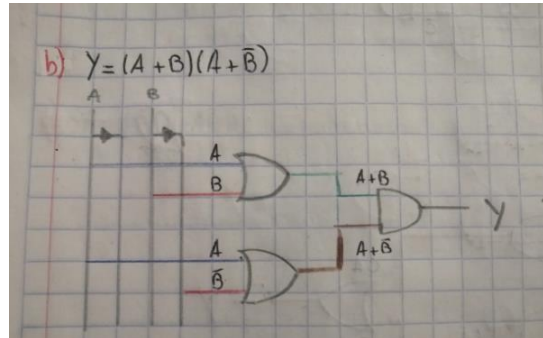
a) $AB + A\bar{B}$

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

A
0
1

b) $Y = (A + B)(A + \bar{B})$

- Circuito lógico



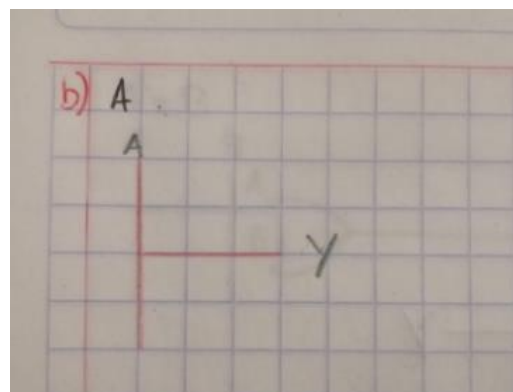
- Simplificación

b) $(A + B)(A + \bar{B}) = A$

$$A + (B(A + \bar{B})) = A + (BA + B\bar{B}) = A + (BA + 0) = A + (BA) = A$$

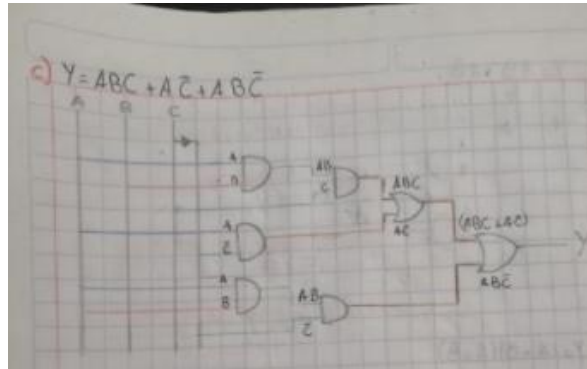
$\textcircled{1} X + (Y \cdot Z) = (X + Y) \cdot (X + Z)$
 $\textcircled{2} X + (Y \cdot Z) = (X + Y) \cdot (X + Z)$
 $\textcircled{3} X \cdot \bar{X} = 0$
 $\textcircled{4} X + 0 = X$
 $\textcircled{5} X \cdot (X + Y) = X$

- Circuito lógico de la ecuación reducida



c) $Y = ABC + A\bar{C} + AB\bar{C}$

- Circuito lógico



- Simplificación

c) $ABC + A\bar{C} + AB\bar{C} = AB + A\bar{C}$

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

factorizar "A"

① $x + (y + z) = (x + y) + z$
 ② $x \cdot y + (x \cdot \bar{y}) = x$
 ③ $x(y + z) = (x \cdot y) + (x \cdot z)$

- Tabla de verdad

c) $ABC + A\bar{C} + AB\bar{C}$

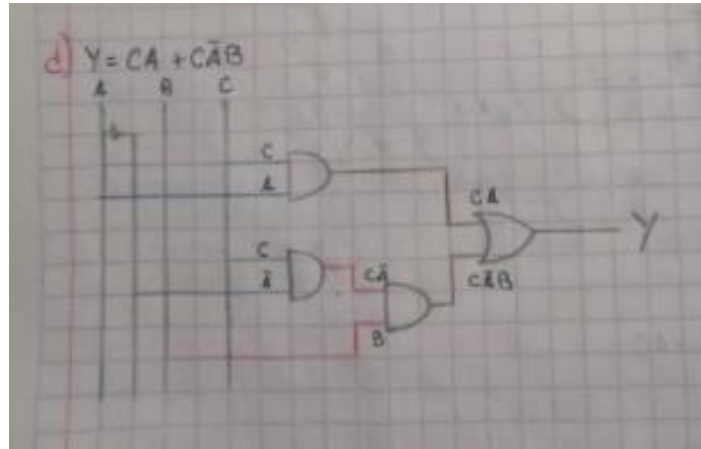
A	B	C	\bar{C}	ABC	$A\bar{C}$	$AB\bar{C}$	$ABC + A\bar{C} + AB\bar{C}$
0	0	0	1	0	0	0	0
0	0	1	0	0	0	0	0
0	1	0	1	0	0	0	0
0	1	1	0	0	0	0	0
1	0	0	1	0	1	0	1
1	0	1	0	0	0	0	0
1	1	0	1	0	1	1	1
1	1	1	0	1	0	0	1

$AB + A\bar{C}$

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

d) $Y = CA + C\bar{A}B$

- Circuito lógico



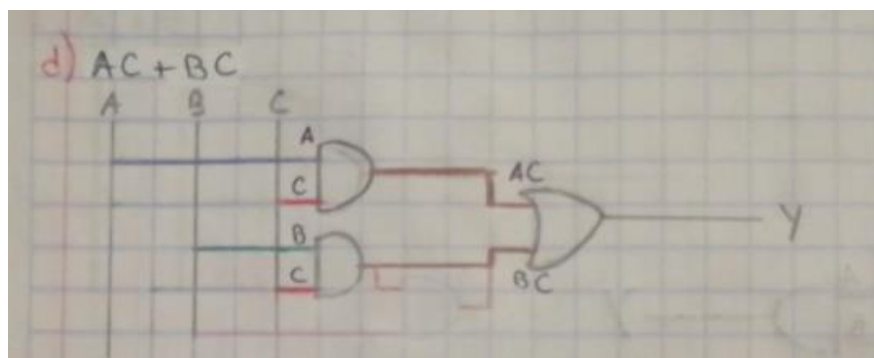
- Simplificación

d) $CA + C\bar{A}B = AC + BC$

$$\begin{aligned}
 C(A + C\bar{A}B) &= \\
 C(A + (\bar{A} \cdot B)) &= \\
 C((A + C)(A + B)) &= \\
 C(A + B) &= \\
 AC + BC &
 \end{aligned}$$

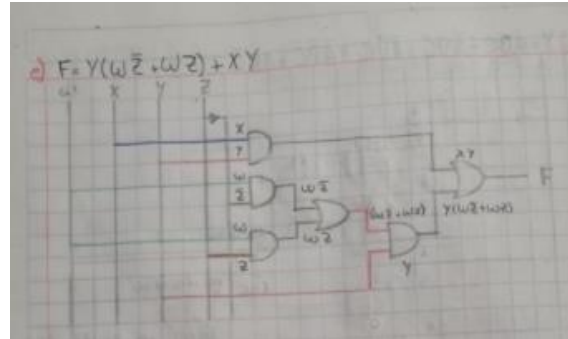
⑤ $x \cdot (y + z) = (x \cdot y) + (x \cdot z)$
 ③ $x \cdot (y \cdot z) = (x \cdot y) \cdot z$
 ⑦ $x \cdot (x + y) = x$
 ⑦ $x \cdot (x + y) = x$
 ⑤ $x \cdot (y + z) = (x \cdot y) + (x \cdot z)$

- Circuito lógico de la ecuación reducida



e) $F = Y(W\bar{Z} + WZ) + XY$

- Circuito lógico



- Simplificación

e) $Y(W\bar{Z} + WZ) + XY = WY + XY$

$Y(W\bar{Z} + WZ) + XY$
 $WY + XY$

⑧ $X \cdot y + (x \cdot \bar{y}) = x$
 ② $X \cdot y \pm y \cdot x$

- Tabla de verdad

e) $Y(W\bar{Z} + WZ) + XY$

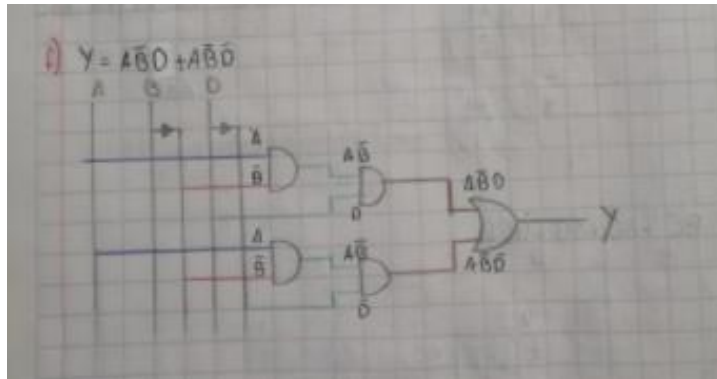
W	X	Y	Z	\bar{Z}	XY	$W\bar{Z}$	WZ	$Y(W\bar{Z} + WZ)$	F
0	0	0	0	1	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0
0	1	0	0	1	0	0	0	0	0
0	1	0	1	0	0	0	0	0	0
0	1	1	0	1	1	0	0	1	1
0	1	1	1	0	1	0	0	1	1
1	0	0	0	1	0	1	0	0	0
1	0	0	1	0	0	1	1	0	0
1	0	1	0	1	0	1	1	1	1
1	0	1	1	0	0	1	1	1	1
1	1	0	0	1	0	1	0	0	0
1	1	0	1	0	0	1	1	0	0
1	1	1	0	1	1	1	1	1	1
1	1	1	1	0	1	1	1	1	1

$WY + XY$

W	X	Y	WY	XY	$WY + XY$
0	0	0	0	0	0
0	0	1	0	0	0
0	1	0	0	0	0
0	1	1	0	1	1
1	0	0	0	0	0
1	0	1	1	0	1
1	1	0	0	0	0
1	1	1	1	1	1

f) $Y = A\bar{B}D + A\bar{B}\bar{D}$

- Circuito lógico



- Simplificación

f) $A\bar{B}D + A\bar{B}\bar{D} = A\bar{B}$

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

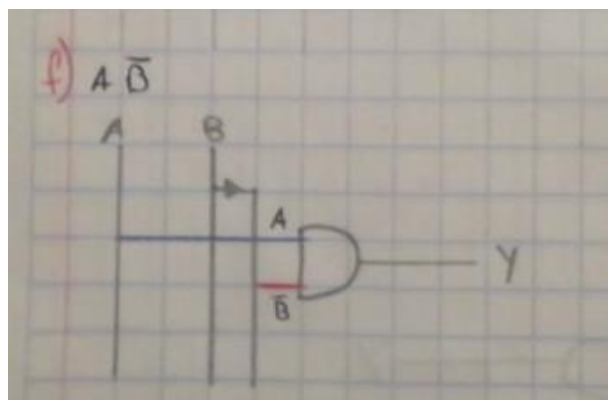
$$(A\bar{B}) \cdot D + \bar{D} =$$

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

$$\underline{A\bar{B}}$$

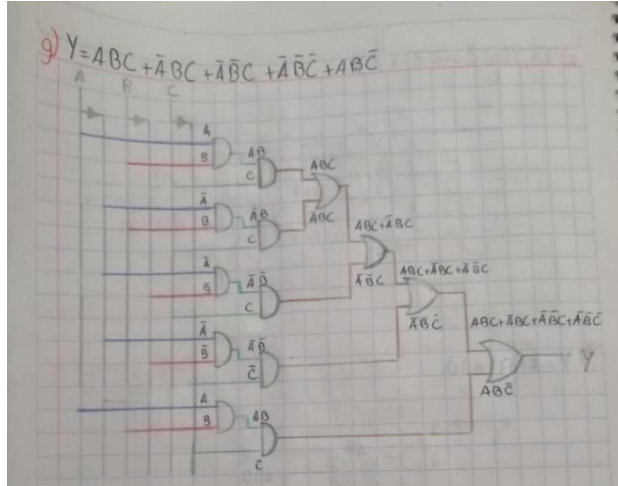
③ $x \cdot (y \cdot z) = (x \cdot y) \cdot z$
 factorizar $(A\bar{B})$
 ③ $x \cdot \bar{x} = 1$
 ③ $x \cdot 1 = x$

- Circuito lógico de la ecuación reducida



g) $Y = ABC + \bar{A}BC + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C} + ABC$

- Circuito lógico



- Simplificación

g) $ABC + \bar{A}BC + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C} + ABC = \bar{A}\bar{B} + AB + AC$

$AB(C + \bar{C}) + \bar{A}BC + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C} =$
 $AB \cdot 1 + \bar{A}B(C + \bar{C}) + \bar{A}\bar{B}C =$
 $AB + \bar{A}\bar{B}(1) + \bar{A}\bar{B}C =$
 $A(B + C) + \bar{A}\bar{B} =$
 $\bar{A}\bar{B} + AB + AC$

! factorizar "AB"
 ② $X + \bar{X} = 1$
 ③ $X + \bar{X} = 1$
 ④ $X \cdot (Y + Z) = (X \cdot Y) + (X \cdot Z)$
 ⑤ $X \cdot (Y + Z) = (X \cdot Y) + (X \cdot Z)$

- Tablas de verdad

g) $ABC + \bar{A}BC + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C} + ABC$

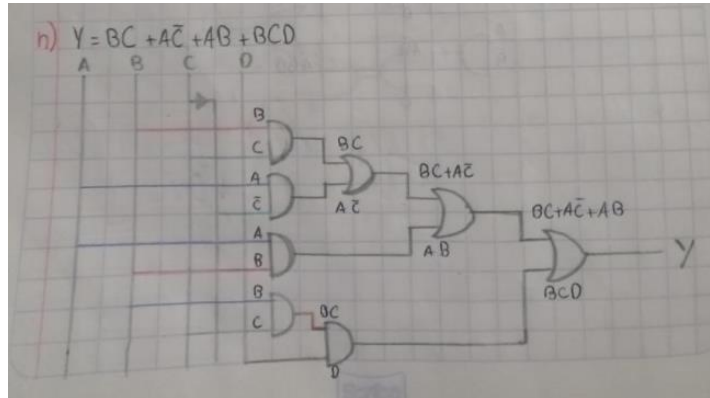
A	B	C	\bar{A}	\bar{B}	\bar{C}	ABC	$\bar{A}BC$	$\bar{A}\bar{B}C$	$\bar{A}\bar{B}\bar{C}$	$ABC + \bar{A}BC + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C}$
0	0	0	1	1	1	0	0	0	1	0
0	0	1	1	1	0	0	0	1	0	0
0	1	0	1	0	1	0	1	0	0	0
0	1	1	1	0	0	0	1	0	0	0
1	0	0	0	1	1	0	0	0	0	0
1	0	1	0	1	0	0	0	0	0	0
1	1	0	0	0	1	0	0	0	0	0
1	1	1	0	0	0	1	0	0	0	1

$\bar{A}\bar{B} + AB + AC$

A	B	C	\bar{A}	\bar{B}	$\bar{A}\bar{B}$	AB	$\bar{A}C$	$\bar{A}\bar{B} + AB + AC$
0	0	0	1	1	0	0	0	1
0	0	1	1	1	0	0	1	1
0	1	0	1	0	0	0	0	0
0	1	1	1	0	0	0	1	1
1	0	0	0	1	0	0	0	0
1	0	1	0	1	0	0	0	0
1	1	0	0	0	1	1	0	1
1	1	1	0	0	1	1	0	1

h) $Y = BC + A\bar{C} + AB + BCD$

- Circuito lógico



- Simplificación

h) $BC + A\bar{C} + AB + BCD = A\bar{C} + CB$

factorizar "B"

① $x + (y + z) = (x + y) + z$

② $x + x = x$

Handwritten simplification steps:

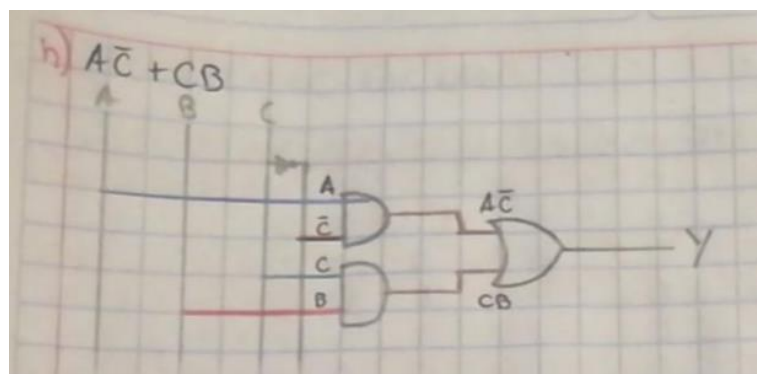
$$BC + A\bar{C} + AB + BCD = A\bar{C} + CB$$

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

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

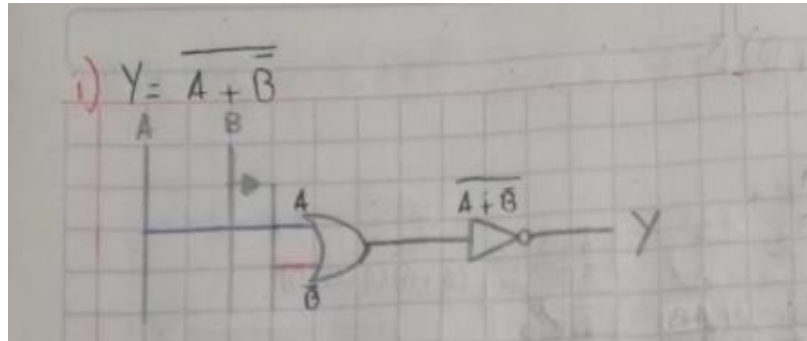
$$A\bar{C} + CB =$$

- Circuito lógico de la ecuación reducida



i) $Y = \overline{A + B}$

- Circuito lógico



- Simplificación

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

$\frac{\overline{A} \cdot \overline{B}}{\overline{A} \cdot B}$

⑩ $\overline{\overline{X + Y}} = \overline{\overline{X}} \cdot \overline{\overline{Y}}$
Doble Negación

- Tablas de verdad

1) $\overline{A + B}$

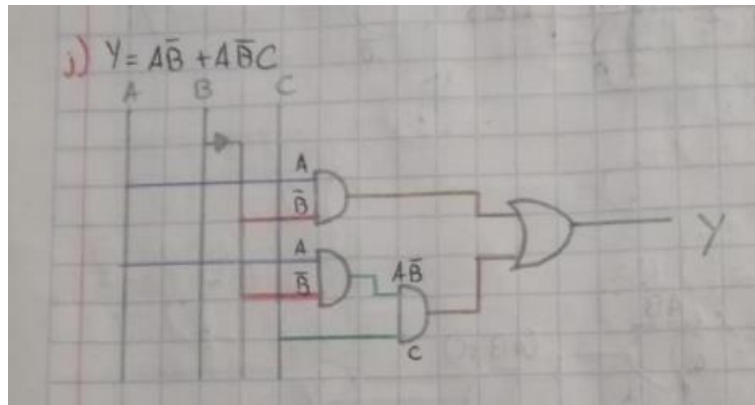
A	B	\overline{B}	$A + \overline{B}$	$\overline{A + \overline{B}}$
0	0	1	1	0
0	1	0	0	1
1	0	1	1	0
1	1	0	1	0

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

A	B	\overline{A}	$\overline{A} \cdot \overline{B}$
0	0	1	0
0	1	1	1
1	0	0	0
1	1	0	0

j) $Y = A\bar{B} + A\bar{B}C$

- Circuito lógico



- Simplificación

j) $A\bar{B} + A\bar{B}C = A\bar{B}$

$A\bar{B}(1+C) =$

$A\bar{B} \cdot 1$

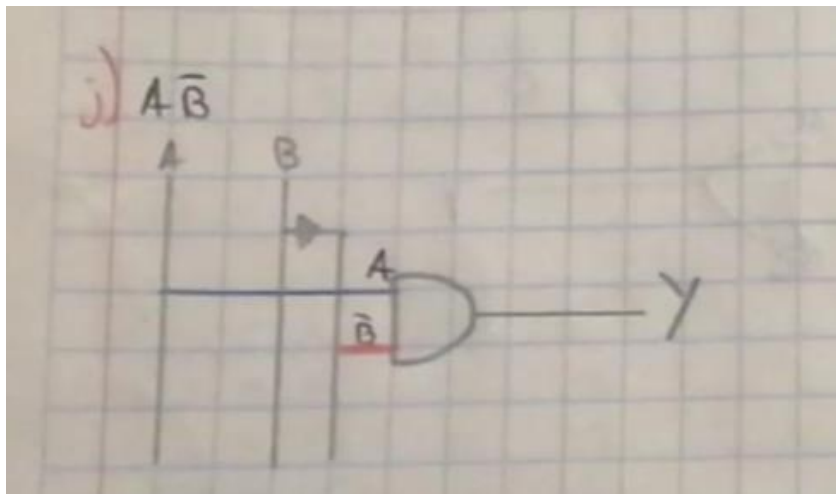
$A\bar{B}$

factorizar " $A\bar{B}$ "

② $X + 1 = 1$

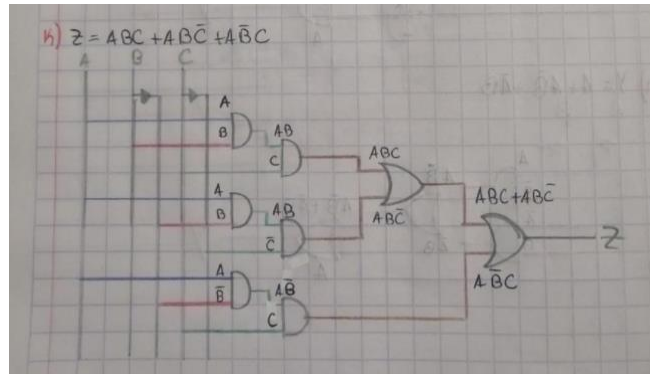
③ $X \cdot 1 = X$

- Circuito lógico de la ecuación reducida



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

- Circuito lógico



- Simplificación

$$14) \quad ABC + AB\bar{C} + A\bar{B}C = AB + AC$$

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

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

$$A(B + C) =$$

$$AB + AC$$

factorizar "A"

⑧ $x \cdot y + (x \cdot \bar{y}) = x$
 ⑩ $x + (\bar{x} \cdot y) = x + y$
 ⑨ $x \cdot (y + z) = (x \cdot y) + (x \cdot z)$

- Tablas de verdad

$Y = ABC + ABC + ABC$

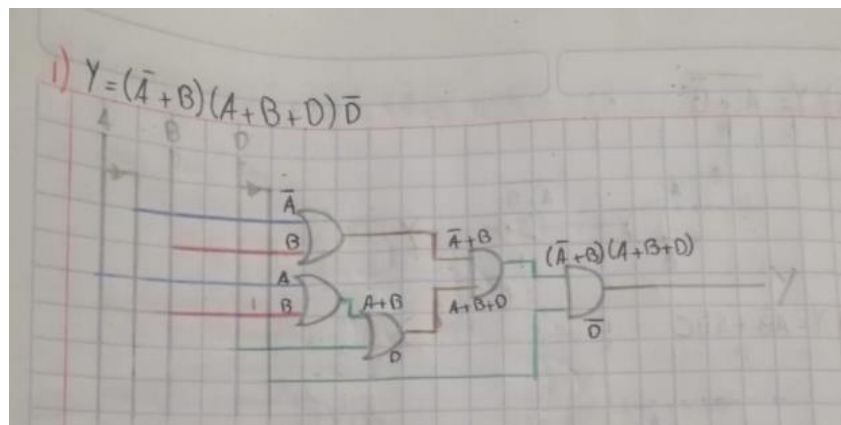
A	B	C	\bar{A}	\bar{B}	\bar{C}	ABC	$\bar{A}\bar{B}C$	$A\bar{B}\bar{C}$	$ABC + \bar{A}\bar{B}C + A\bar{B}\bar{C}$
0	0	0	1	1	1	0	0	0	0
0	0	1	1	1	0	0	0	0	0
0	1	0	1	0	1	0	0	0	0
0	1	1	1	0	0	0	0	0	0
1	0	0	1	1	0	0	0	0	0
1	0	1	1	0	0	0	0	1	1
1	1	0	0	1	0	1	0	0	1
1	1	1	0	0	0	1	0	0	1

$AB + AC$

A	B	C	AB	AC	AB + AC
0	0	0	0	0	0
0	0	1	0	0	0
0	1	0	0	0	0
0	1	1	0	0	0
1	0	0	0	0	0
1	0	1	0	1	1
1	1	0	1	0	1
1	1	1	1	1	1

1) $Y = (\bar{A} + B)(A + B + D)\bar{D}$

- Circuito lógico



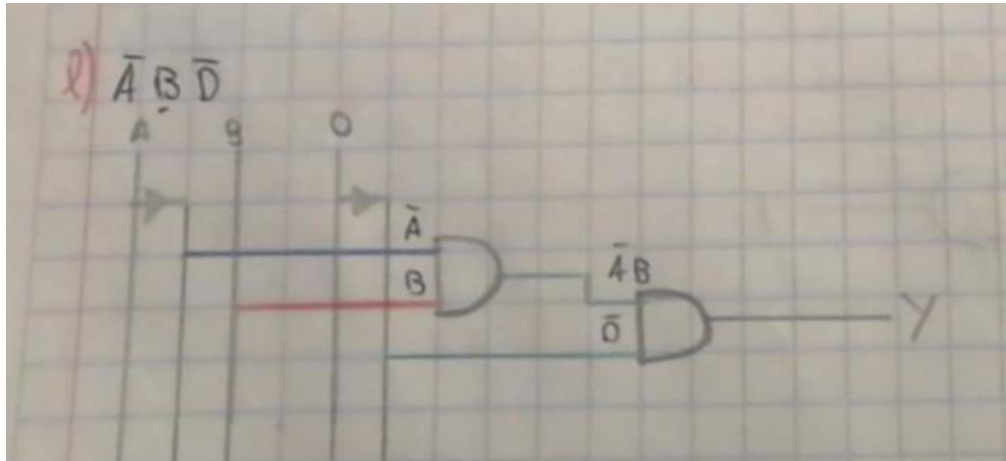
- Simplificación

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

$\bar{A} + (B(A + B + D))\bar{D}$
 $\bar{A} + (B) \bar{D}$
 $\bar{A}B\bar{D}$

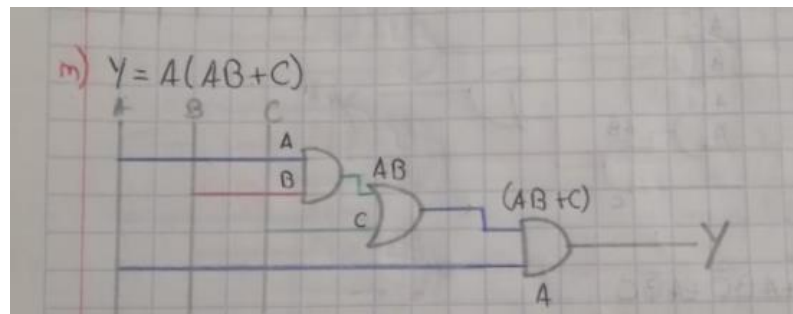
③ $x \cdot (y \cdot z) = (x \cdot y) \cdot z$
 ④ $x \cdot (x + y) = x$
 ⑤ $x \cdot (y \cdot z) = (x \cdot y) \cdot z$

- Circuito lógico de la ecuación reducida



m) $Y = A(AB + C)$

- Circuito lógico



- Simplificación

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

$$\begin{aligned} & (A(AB) + AC) \\ & (AA)B + AC \\ & \underline{AB + AC} \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad & x \cdot (y + z) = (x \cdot y) + (x \cdot z) \\ \textcircled{3} \quad & x \cdot (y \cdot z) = (x \cdot y) \cdot z \\ \textcircled{7} \quad & x \cdot x = x \end{aligned}$$

- Tablas de verdad

m) $A(AB+C)$

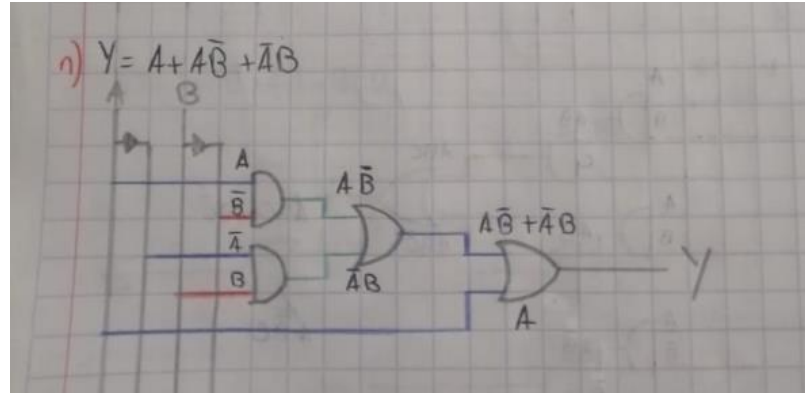
A	B	C	AB	AB+C	A(AB+C)
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	0	0	0
0	1	1	0	1	0
1	0	0	0	0	0
1	0	1	0	1	1
1	1	0	1	1	1
1	1	1	1	1	1

$AB+AC$

A	B	C	AB	AC	AB+AC
0	0	0	0	0	0
0	0	1	0	0	0
0	1	0	0	0	0
0	1	1	0	0	0
1	0	0	0	0	0
1	0	1	0	1	1
1	1	0	1	0	1
1	1	1	1	1	1

n) $Y = A + A\bar{B} + \bar{A}B$

- Circuito lógico



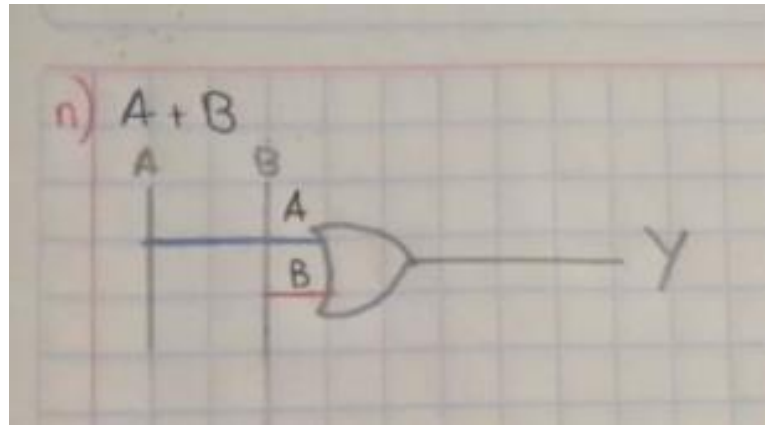
- Simplificación

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

$(A + \bar{A}B) + \bar{A}B$
 $(A + B) + \bar{A}B$
 $A + (B + \bar{A}B)$
 $A + (A + B)$
 $(A + A) + B$
 $A + B$

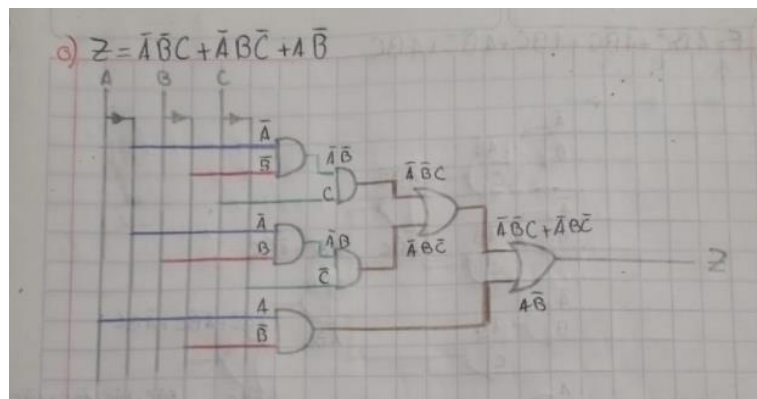
④ $x + (y + z) = (x + y) + z$
 ⑫ $x + \bar{x} \cdot y = x + y$
 ④ $x + (y + z) = (x + y) + z$
 ⑫ $x + \bar{x} \cdot y = x + y$
 ④ $x + (y + z) = (x + y) + z$
 ⑥ $x + x = x$

- Circuito lógico de la ecuación reducida



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

- Circuito lógico



- Simplificación

o) $\bar{A}\bar{B}C + \bar{A}B\bar{C} + AB = \bar{A}B\bar{C} + A\bar{B} + \bar{B}C$

$\bar{A}(\bar{B}C + B\bar{C}) + AB$
 $\bar{A}B\bar{C} + (\bar{B}C) + A\bar{B}$
 $\bar{A}B\bar{C} + A\bar{B} + \bar{B}C$

"factorizar" \bar{A}
 ③ $x \cdot (y+z) = (x \cdot y) + (x \cdot z)$
 ④ $x + (y \cdot z) = (x+y) \cdot z$

- Tablas de verdad

o) $\bar{A}\bar{B}C + \bar{A}B\bar{C} + AB$

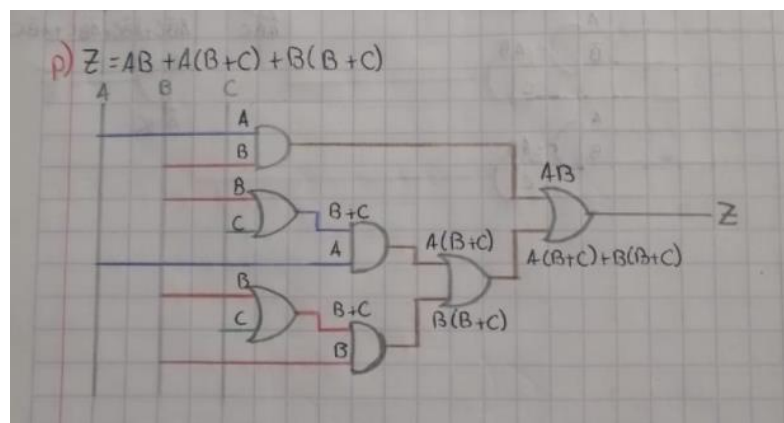
A	B	C	\bar{A}	\bar{B}	\bar{C}	$\bar{A}\bar{B}C$	$\bar{A}B\bar{C}$	AB	$\bar{A}\bar{B}C + \bar{A}B\bar{C} + AB$
0	0	0	1	1	1	0	0	0	0
0	0	1	1	1	0	1	0	0	1
0	1	0	1	0	1	0	1	0	1
0	1	1	1	0	0	0	0	0	0
1	0	0	0	1	1	0	0	1	1
1	0	1	0	1	0	0	0	1	1
1	1	0	0	0	1	0	0	0	0
1	1	1	0	0	0	0	0	0	0

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

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

p) $Z = AB + A(B + C) + B(B + C)$

- Circuito lógico



- Simplificación

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

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

$A(B+C) + B =$

$AB + AC + B =$

$AC + B$

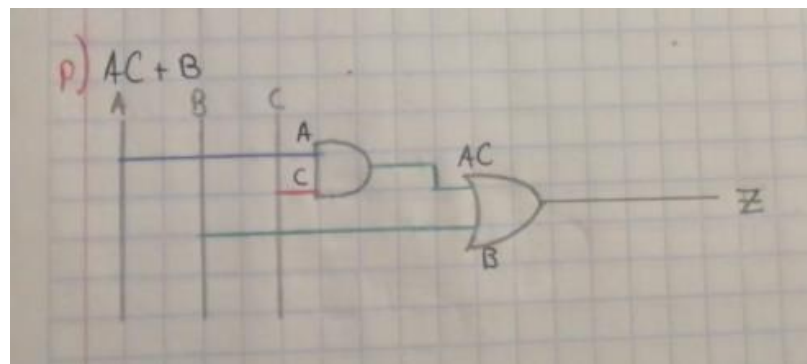
factorizar "A"

⑤ $x \cdot (y+z) = (x \cdot y) + (x \cdot z)$

⑥ $x+x = x$

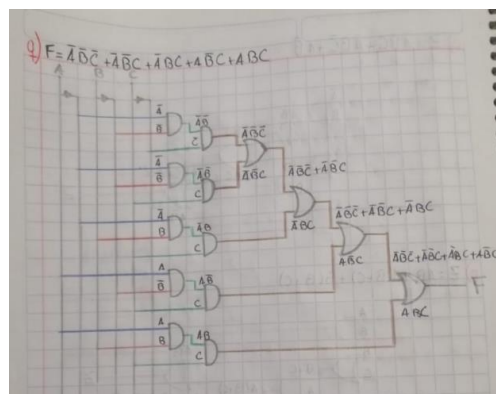
⑦ $x \cdot (x+y) = x$

- Circuito lógico de la ecuación reducida



q) $F = \overline{A}\overline{B}\overline{C} + \overline{A}\overline{B}C + \overline{A}B\overline{C} + A\overline{B}\overline{C} + ABC$

- Circuito lógico de la ecuación reducida



- Simplificación

$$9) \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}BC + A\bar{B}C + ABC = \bar{A}\bar{B} + C$$

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

$$\bar{A}\bar{B}(1) + \bar{A}\bar{B}C + A\bar{B}C + ABC =$$

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

$$\bar{A}\bar{B} + C(1 + AB) =$$

$$\bar{A}\bar{B} + C(1) =$$

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

factorizar " $\bar{A}\bar{B}$ "
 ① $X + \bar{X} = 1$
 factorizar " C "
 ② $X + X = 1$
 ③ $X + 1 = 1$
 ④ $X \cdot 1 = X$

- Tablas de verdad

9) $\bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}BC + A\bar{B}C + ABC$

A	B	C	$\bar{A}\bar{B}\bar{C}$	$\bar{A}\bar{B}C$	$\bar{A}BC$	$A\bar{B}C$	ABC	$\bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}BC + A\bar{B}C + ABC$
0	0	0	1	0	0	0	0	1
0	0	1	0	1	0	0	0	1
0	1	0	0	0	1	0	0	1
0	1	1	0	0	0	1	0	1
1	0	0	0	0	0	0	1	1
1	0	1	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0
1	1	1	0	0	0	0	0	0

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

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