ARQUITECTURA DE LAS COMPUTADORAS
Ejercicios de CIRCUITOS LÓGICOS para dar en clases

1) Dada la siguiente tabla de verdad, obtener la 1er. forma canónica algebraica y la numérica, el circuito y la 2da. forma canónica numérica y algebraica de la función:

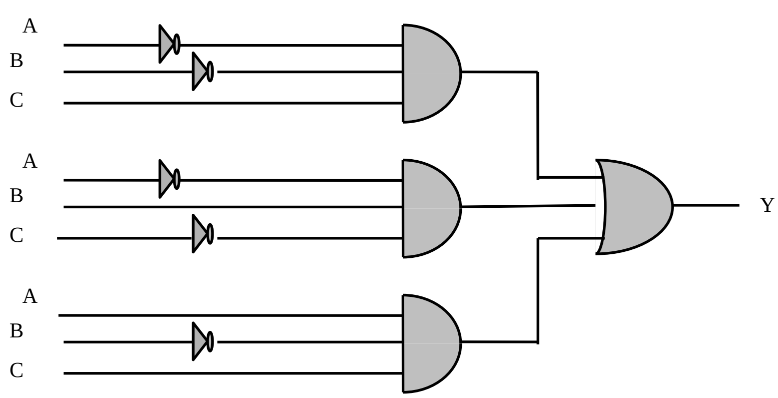
A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

RESPUESTA: $Y = A' \cdot B' \cdot C + A' \cdot B \cdot C' + A \cdot B' \cdot C$

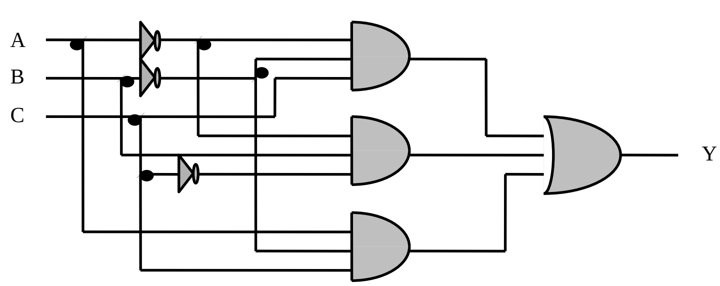
$Y = Y(A,B,C) = \sum_3 m_i\,(1,2,5)$

$Y = \prod_3 M_i\,(0,3,4,6,7)$

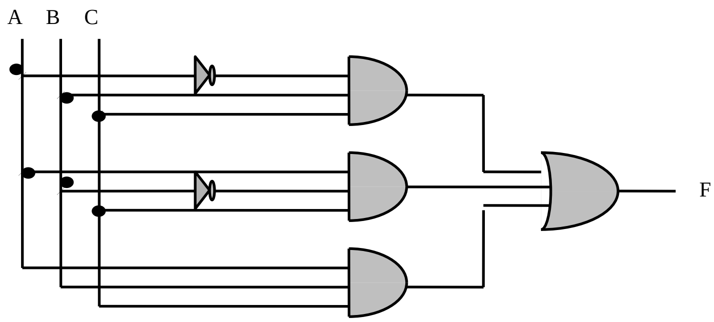
$Y = (A+B+C) \cdot (A+B'+C') \cdot (A'+B+C) \cdot (A'+B'+C) \cdot (A'+B'+C')$



Otra forma de hacer el circuito:



2) Dado el siguiente circuito, obtener la 1er. forma canónica algebraica y la numérica, la 2da. forma canónica numérica y algebraica y la tabla de verdad de la función respectiva:



RESPUESTA: $F = A' . B . C + A . B' . C + A . B . C$

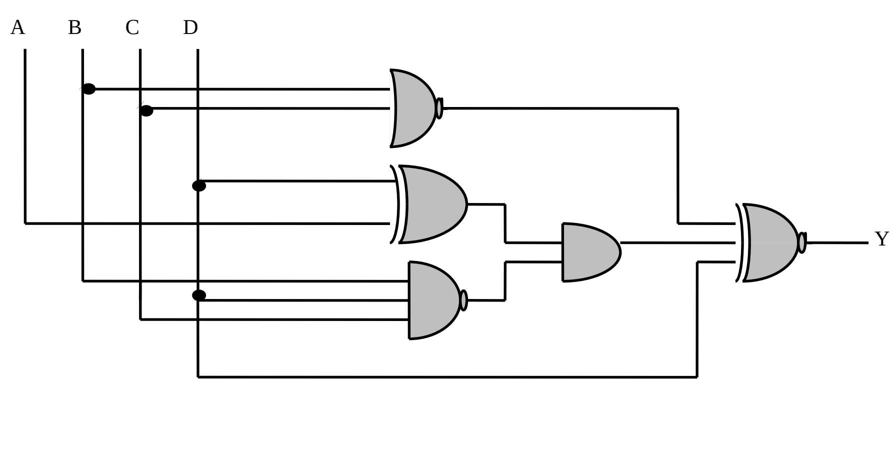
$F = \sum_3 m_i\ (3,5,7)$

$F = \prod_3 M_i\ (0,1,2,4,6)$

$F = (A+B+C) . (A+B+C') . (A+B'+C) . (A'+B+C) . (A'+B'+C)$

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

3) Escribir la expresión algebraica de la función del siguiente circuito:

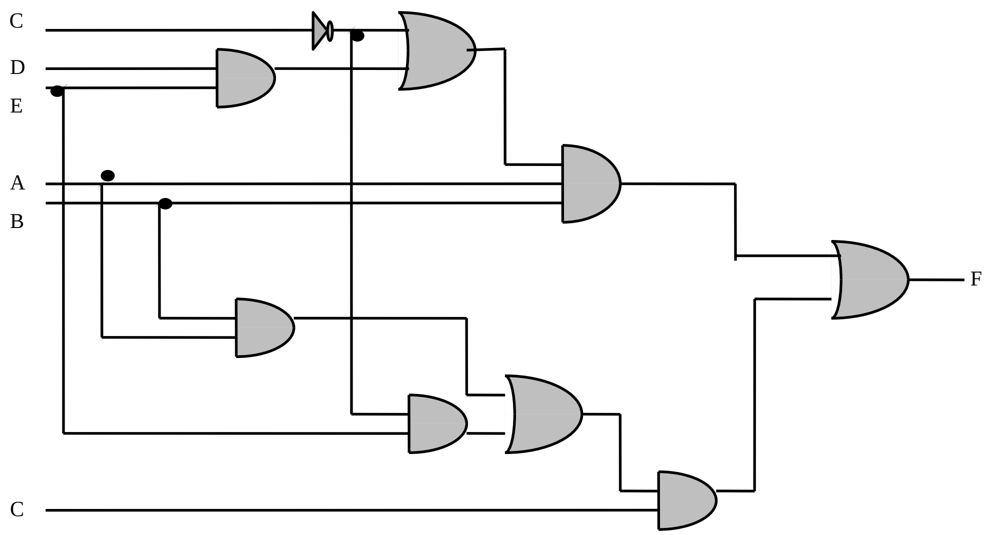


RESPUESTA: $Y = \{ (B + C)' \oplus [(D \oplus A) . (B . C . D)'] \oplus D \}'$

4) Hacer el circuito de la siguiente función:

$$F = (C' + D.E) . A . B + (A.B + C'.E) . C$$

RESPUESTA:



5) Dada la siguiente función, escribir la tabla de verdad de la misma:

$$F_3 = A . B + C$$

RESPUESTA:

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

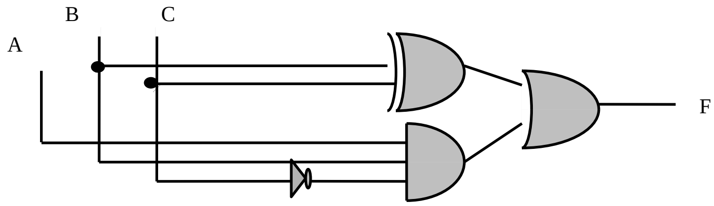
6) Dada la siguiente función, escribir su 1er. f. canónica:

$$F_4 = A . B . C . D' + A . B . C'$$

RESPUESTA: $F = \sum_4 m_i\ (14,12,13)$

$F = A.B.C.D' + A.B.C'.D' + A.B.C'.D$

7) Escribir la expresión algebraica y la 1er. f. canónica de la función cuyo circuito es el siguiente:



RESPUESTA: $F = (B \oplus C) + A \cdot B \cdot C' = B' \cdot C + B \cdot C' + A \cdot B \cdot C'$

$\therefore \quad F = \sum_3 m_i\,(1, 5, 2, 6)$

$F = A'.B'.C + A.B'.C + A'.B.C' + A.B.C'$

8) Escribir la 2da. forma canónica numérica y la algebraica de la siguiente función:

$F = (A.B.C)' + (A \oplus B)$

RESPUESTA:

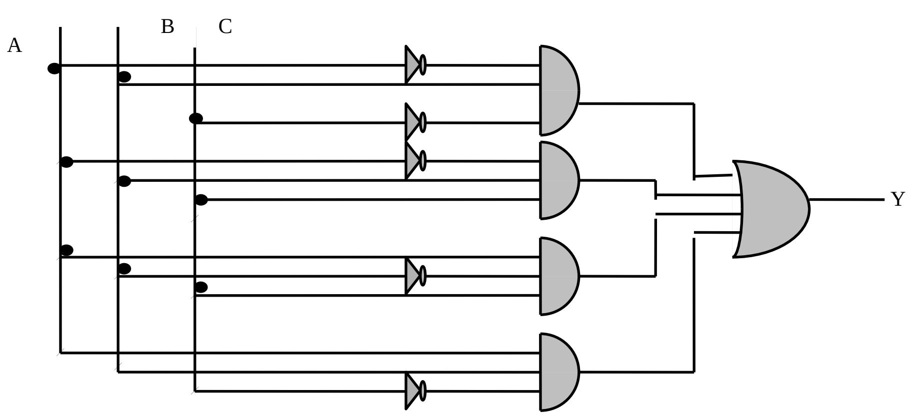
A B C	(A.B.C)'	$A \oplus B$	F
0 0 0	1	0	1
0 0 1	1	0	1
0 1 0	1	1	1
0 1 1	1	1	1
1 0 0	1	1	1
1 0 1	1	1	1
1 1 0	1	0	1
1 1 1	0	0	0

$F = \prod_3 M_i\,(7)$ $\qquad F = \overline{A} + \overline{B} + \overline{C}$

9) Dada la siguiente función, dibujar el circuito correspondiente:

$Y = \sum_3 m_i\,(2,3,5,6)$

RESPUESTA:



10) Dada la siguiente función, determinar la 1er. f. c. numérica y la 2da. algebraica:

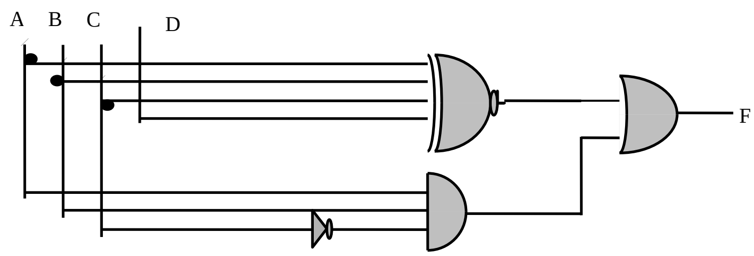
$F(A,B,C) = A$

RESPUESTA: $F = \sum_3 m_i (4, 5, 6, 7)$

➔ $F = \prod_3 M_i (0, 1, 2, 3)$

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

11) Dado el siguiente circuito, determinar la 1er. f. c. numérica de la función:



RTA.: a) $F = (A \oplus B \oplus C \oplus D)' + A \cdot B \cdot \overline{C}$

F = 1 cuando uno, o los dos sumandos valen "1"

Analizando:

$F_1 = A \cdot B \cdot \overline{C} = A \cdot B \cdot \overline{C} \cdot D + A \cdot B \cdot \overline{C} \cdot \overline{D}$ ➔ $F_1 = \sum_4 m_i (13, 12)$

$F_2 = (A \oplus B \oplus C \oplus D)'$ marca paridad par ➔ busco cuándo hay paridad par:

A	B	C	D			A	B	C	D		
1	1	1	1	→	15	0	1	1	0	→	6
1	1	0	0	→	12	0	1	0	1	→	5
1	0	1	0	→	10	0	0	1	1	→	3
1	0	0	1	→	9	0	0	0	0	→	0

∴ $F_2 = \sum_4 m_i (0, 3, 5, 6, 9, 10, 12, 15)$

⇨ $F = F_1 + F_2 = \sum_4 m_i (0, 3, 5, 6, 9, 10, 12, 13, 15)$

b) O bien, puede resolverse haciendo la tabla de verdad.

12) Escribir la 2da. f. c. numérica y algebraica de la siguiente función lógica:

$$Y = (A \oplus B) . C + (A . B + B . C)' . A$$

RTA.: $Y = \underbrace{(A \oplus B) . C}_{Y_1} + \underbrace{(A . B + B . C)' . A}_{Y_2}$

A	B	C	$(A \oplus B)$	Y_1	$A . B$	$B . C$	$(A . B + B . C)'$	Y_2	**Y**
0	0	0	0	0	0	0	1	0	**0**
0	0	1	0	0	0	0	1	0	**0**
0	1	0	1	0	0	0	1	0	**0**
0	1	1	1	1	0	1	0	0	**1**
1	0	0	1	0	0	0	1	1	**1**
1	0	1	1	1	0	0	1	1	**1**
1	1	0	0	0	1	0	0	0	**0**
1	1	1	0	0	1	1	0	0	**0**

$Y = \prod_3 M_i\,(0, 1, 2, 6, 7)$

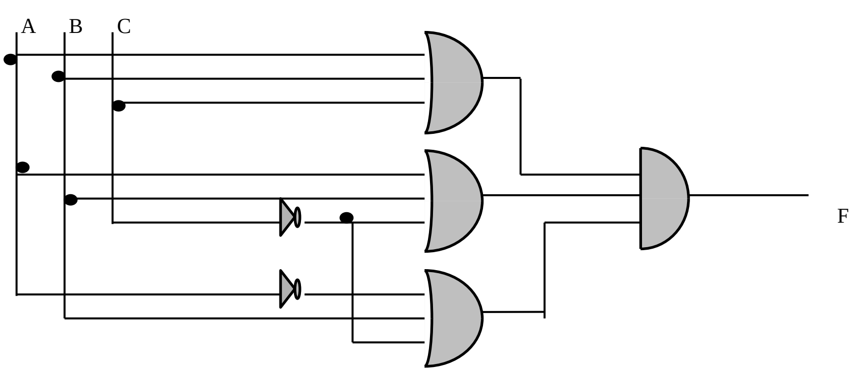
$Y = (A+B+C) . (A+B+\overline{C}) . (A+\overline{B}+C) . (\overline{A}+\overline{B}+C) . (\overline{A}+\overline{B}+\overline{C})$

13) Dada F(A,B,C) = A'.B.C+A.B.C'+A'.B.C'+A.B'.C'+A.B.C , encontrar la 2da. Forma Canónica y el circuito que ésta representa.

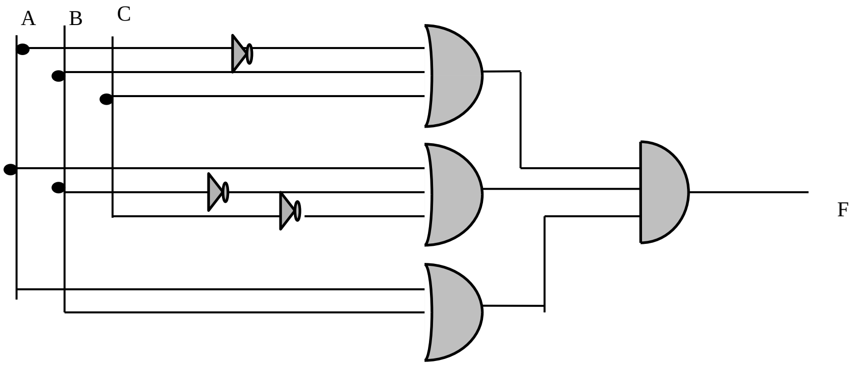
RTA.: $F = \Sigma_3\, m_i\,(3, 6, 2, 4, 7) = \Sigma_3\, m_i\,(2, 3, 4, 6, 7)$

➔ $F = \Pi_3\, M_i\,(0,1,5)$ 2a F.C.N.

$F = (A+B+C).(A+B+C').(A'+B+C')$ 2a F.C.A.



14) Dado el circuito, encontrar la función lógica respectiva y la 1er. F.C. y la T. De V.



RTA.: F= (A’+B+C).(A+B’+C’).(A+B)

➔ F= Π_3 M_i (4,3,1,0)

➔ F= Σ_3 m_i (2,5,6,7) 1er.F.C.N.

F= A’.B.C’+A.B’.C+A.B.C’+A.B.C 1er.F.C.A.

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

MINIMIZACIÓN

MINIMIZACIÓN POR ÁLGEBRA DE BOOLE:

Simplificar, hasta llegar a la mínima expresión, utilizando las leyes del álgebra de Boole (pueden existir o no, varios caminos diferentes para resolver cada ejercicio, aquí mostraremos una sola forma para resolverlos) y comprobar que verifique la tabla de verdad:

1) $F = \Sigma_4\, m_i\,(5,7,13,15) = A'.B.C'.D + A'.B.C.D + A.B.C'.D + A.B.C.D =$

$= A'.B.D.(C'+C) + A.B.D.(C'+C) = B.D$

Para demostrar que la función del resultado es equivalente a la función dada como enunciado, puede realizarse la tabla de verdad, o la parte de la misma que nos interesa:

A B C D	decimal
0 1 0 1	5
0 1 1 1	7
1 1 0 1	13
1 1 1 1	15

2) $F = \Sigma_3\, m_i\,(0,1,2,3,4,5) = A'.B'.C' + A'.B'.C + A'.B.C' + A'.B.C + A.B'.C' + A.B'.C =$

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

I) $= A'.B' + A'.B + A.B' + \mathbf{A'.B'} = A'.(B'+B) + B'.(A'+A) = A' + B' = (A.B)'$

(II) $= A'.B' + A'.B + A.B' = A'.(B'+B) + AB' = A' + A.B' = A' + B' = (A.B)'$

(III) $= A'.B' + A'.B + A.B' = B'.(A'+A) + A'.B = B' + A'.B = B' + A' = (B.A)'$

3)

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

$F = A'.B'.C + A.B'.C' + A.B'.C + A.B.C' = B'.C.(A'+A) + A.C'.(B'+B) = B'.C + A.C'$

O bien, trabajando por los "0": F = (A+B+C).(A+B'+C).(A+B'+C').(A'+B'+C') =

= (A+C) . (B'+C') = (A+C) . (B . C)'

4) F = Π_3 M_i(0,1,4,7) = (A+B+C).(A+B+C').(A'+B+C).(A'+B'+C') =

= (A+B+C.C') . (A.A'+B+C) . (A'+B'+C') = (A+B) . (B+C).(A'+B'+C') =

(I) = (B+A.C) . (B'+(A.C)') = B.(A.C)'+(A.C).B' = B ⊕ (A.C)

(II) = (B + A.C) . (A . B . C) '

5) Y= A'.B'.C'.D'+A'.B.C'.D'+A'.B+A'.B.C'.D+B =

= A'.B'.C'.D'+ B .(A'.C'.D'+A'+A'.C'.D+1) = A'.B'.C'.D'+ B = B'.(A+C+D)' + B =

= B + (A + C + D)'

6) Y = A.B.C'+ A.B'.C.D + A.B'.C.D'+ A'.B'.C.D + A'.C =

=A.B.C' + A.B'.C.(D+D') + A'.C.(B'.D+1) = A.B.C'+ A.B'.C + A'.C=

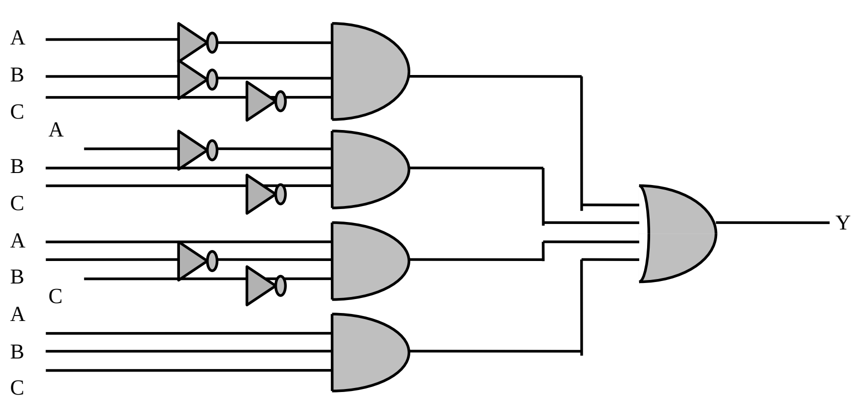
(I) = A.B.C'+C.(A.B'+A') = A.B.C'+C.(B'+A') = A.B.C'+C.(B.A)' = C ⊕ B.A

(II) = A . (B . C' + B' . C) + A' . C = A . (B ⊕ C) + A' . C

(III) = A . (B . C' + B' .C) + C . (A .B' + A') = A . (B ⊕ C) + C . (A' + B') =

= A . (B ⊕ C) + C . (A . B)'

7)



Y = A'.B'.C' + A'.B.C' + A.B'.C'+ A.B.C = A'.C'.(B'+B) + B'.C'.(A'+A) + A.B.C =

=A'.C' + B'.C' + A.B.C = C'.(A'+B') + C.A.B= C´(A.B)' + C.A.B = (C ⊕ (A.B))'

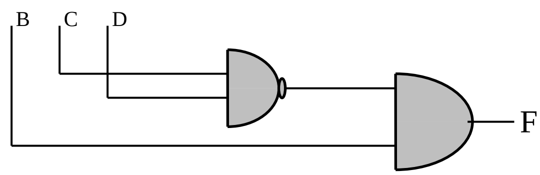
8) = Σ_4 m_i (4,5,6,12,13,14) , y dibujar el circuito mínimo.

F= A'.B.C'.D'+A'.B.C'.D+A'.B.C.D'+A.B.C'.D'+A.B.C'.D+A.B.C.D'=

= A´.B.C'.(D'+D) + B.C.D'.(A'+ A) + A.B.C'.(D'+D) =

= A´.B.C'+B.C.D'+A.B.C' = B.C.D'+B.C'.(A'+ A) = B.C.D'+ B.C' =

= B.(C.D'+C') = B.(D'+C') = B . (D . C)'



9) S= A'.B'.C'.D'+A'.B'.C'.D+A'.B.C.D'+A'.B.C.D+A.B.C=

= A'.B'.C'. (D'+D) + A'.B.C .(D'+D) + A.B.C = A'.B'.C' + A'.B.C + A.B.C =

(I) = A'.B'.C'+ B . C .(A'+ A) = (A + B + C) ' + B.C

(II) = A' (B´.C´+B.C) + A.B.C = A' (B⊕C)' + A.B.C= [A+ (B⊕C)]' + A.B.C

10) Y= A'.B'.C'.D'+ A'.B + A'.B'.C.D + B'+A'.B.C'.D'=

= A'.B. (1+ C'.D') + B'.(A'.C'.D'+A'.C.D+1) = A'.B + B' = A'+ B' = (A . B)'

11) F= Σ_4 m_i (0, 1, 3, 4, 5, 7, 11,1 5) = A'.B'.C'.D'+ A'.B'.C'.D + A'.B'.C.D + A'.B.C'.D'+
+A'.B.C'.D + A'.B.C.D + A.B'.C.D + A.B.C.D =

= A'.B'.C'.(D'+D) +A'.B.C'.(D'+D) + B'.C.D.(A'+A) + B.C.D.(A'+A) =

= A'.B'.C'+ A'.B.C'+ B'.C.D + B.C.D = A'.C'.(B'+B) + C.D.(B'+B) =

= A'.C' + C.D = (A+C)' + C.D

12) $F = \Pi_4\, M_i\,(0, 2, 5, 7, 13, 15) =$

$=(A+B+C+D).(A+B+C'+D).(A+B'+C+D').(A+B'+C'+D').(A'+B'+C+D').(A'+B'+C'+D')=$

$=(A + B + D + C.C').(A+ B'+ D'+ C.C').(A'+ B'+ D'+ C.C') =$

$= (A+ B+ D).(A+ B'+ D').(A'+ B'+ D') = (A + B + D).(A.A'+ B'+ D') =$

$= (A+B+D).(B'+D') =$

(I) $= (BD)' . (A+B+D)$

(II) $= A.B'+A.D'+B.D'+D.B'=$ (por 9 a) $= A.B'+ B.D'+ D.B'=$

(a) $= A.B'+ (B \oplus D)$

(b) $= B' . (A + D) + (B \oplus D)$

(c) $= B' . (A + D) + B . D'$

(III) $= A.B'+ A.D'+ B.D'+ D.B'=$

(a) $= A . (B'+D') + (B \oplus D) = A . (B.D)' + (B \oplus D)$

(b) $= D' + (A + B) + B' . (A + D)$

13) $Y= A'.B'.C'.D'+ A'.B'.C'.D + A'.B'+ A'.B'.C.D + B=$

$= A'.B'.(C'.D' + C'.D + 1 + C.D) + B = A'.B'+ B = B + A'$

14) $F= A'.B'.C'.D+A'.B.C'.D+A'.B+A'.B.D'+A'.B.C'+D=$

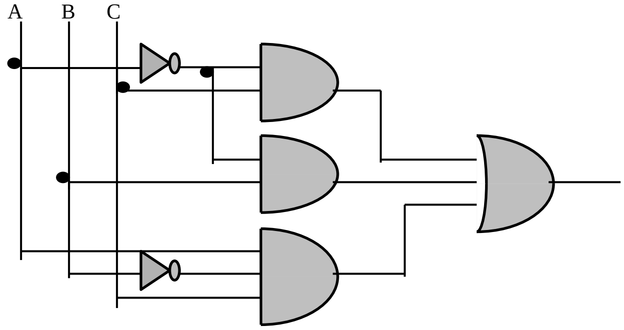
$= A'.B.(C'.D + 1+ D'+ C') + D.(A'.B'.C'+1) = A'. B + D$

O bien:

$F= A'.B'.C'.D+A'.B.C'.D+A'.B+A'.B.D'+A'.B.C'+D=$

$= A'.B.(1+ D'+ C') + D.(A'.B'.C'+ A'.B.C' + 1) = A'. B + D$

15)



S= A’.C + A’.B + A.B´.C = C.(A’+A . B’) + A’.B = C. A’+ C . B’+ A’.B =

(I)(por 9a) = A’.B + B’.C

(II)= A’.B + C.(A’+B’) = A’.B + C.(A.B)’

16) Y= A’.B’C’.D + A’.B’.C.D + A’.B.C’.D + A’.B.C.D + A’.B.C =

= A’.C’.D .(B’+ B) + A’.B.C + A’.C.D .(B’+ B) = A’.C’.D + A’.B.C + A’.C.D =

= A’.D.(C’+C) + A’.B.C = A’.D + A’.B.C = A’.(D + B.C)

17)

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

F= A.B.C + A.B’.C + A.B.C’+ A’.B.C + A’.B’.C’ =

= A.B .(C+C’) + A.C.(B+B’) + B.C .(A+A’) + A’.B’.C’=

= A.B + A.C + B.C + A’.B’.C’ = A.B + C.(A+B) + C’.(A+B)’ =

= A.B + (C ⊕ (A+B))’

O bien:

F = (A + B + C’) . (A + B’+ C) . (A’+ B + C) = [A+ (B + C’) . (B´+C)] . (A´+ B + C) =

= [A+ B . C + B´.C´)] . (A´+ B + C) = [A+ (B ⊕ C)’] . (A’+ B + C)

O también:

F = (A + B + C’) . (A + B’+ C) . (A’+ B + C) =

= [A+ (B + C’) . (B’+C)] . [C+ (A + B’) . (A’+B)] =
= [A+ B . C + B’.C’)] . [C+ A .B + B’.A’)] = [A+ (B ⊕ C)’] . [C+ (A ⊕ B)’]

O: F = (A + B + C’) . (A + B’+ C) . (A’+ B + C) = (A+ B + C’) . [C+ (A + B’) . (A´+B)] =
= (A+ B + C’) . [C+ A .B + B’.A’)] = (A+ B + C’) . [C+ (A ⊕ B)’]

18) F = B.C.D + A’.B’.C’.D + A’.B’.C’.D’+ B´.C.D =

= C.D.(B+B’) + A’.B’.C’ .(D+D’) = C.D + A’.B’.C’ = C.D + (A+B+C)’

19) F = A’.B’.C’+ A.B.C.D + B.C’.D + A’.C.D + A.B’.D + B.C’.D =

=A’.B’.C’+ B. D.(A. C+ C’) + C.D.(A’+A. B) + A.D.(B’+ B. C) =

= A’.B’.C’ + B.D.C’ + B.D.A + C.D.A’+ C.D.B + A.D.B’+ A.D.C =

= B.D.(C’+C) + A.D.(B+B’) + C.D.(A’+A) + A’.B’.C’ = B.D + A.D + C.D + A’.B’.C’ =

= D.(B + A + C) + A’.B’.C’ = D.(B + A + C) + (A + B + C)’ = D + (A + B + C)’

20) Dada la siguiente tabla, construir la tabla de verdad completa. Desarrollar la función por minterms y por maxterms. Simplificarlas. Dibujar circuito mínimo.

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

RTA.:

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

F= A'.B'.C'+ A'.B'.C + A.B'.C' =

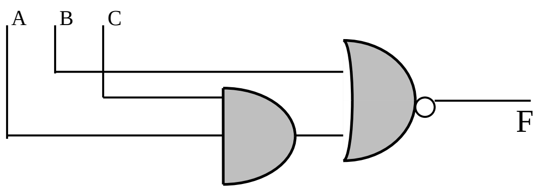
I) = A'.B' .(C'+C) + B´.C'.(A'+A) = A'.B' + B´.C' = B'.(A'+C') = B'. (A. C)' = (B +A. C)'

II) = A'.B' .(C'+C) + A. B'.C' = A'.B' + A.B´.C' = B'.(A'+AC') = B'.(A'+ C') = B'.(A.C)' =
= (B + A. C)'

F= (A+ B'+ C) . (A+ B'+C') . (A'+ B + C') . (A'+ B'+ C) . (A'+ B'+ C') =

= (A + B'+ C.C') . (A'+ C'+ B.B') . (A'+ B'+ C.C') = (A + B') . (A'+ C') . (A'+ B') =

= B'. (A'+ C') = B' . (AC)' = (B + A.C)'



<u>MINIMIZACIÓN POR MAPA DE KARNAUGH:</u>

<u>Ejercicios:</u> Repetiremos algunos de los ejercicios dados en minimización por Álgebra de Boole.

1) F $=\Sigma_4$ mi (5,7,13,15) = A'.B.C'.D+A'.B.C.D+A.B.C'.D+A.B.C.D

CD \ AB	0 0	0 1	1 1	1 0
0 0				
0 1		1	1	
1 1		1	1	
1 0				

F = B . D

2) F = Σ_3 mi (0,1,2,3,4,5) = A'.B'.C'+A'.B'.C+A'.B.C'+A'.B.C+A.B'.C'+A.B'.C

C \ AB	0 0	0 1	1 1	1 0
0	1	1		1
1	1	1		1

F = A' + B' = (A . B)'

3)

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

C \ AB	0 0	0 1	1 1	1 0
0			1	1
1	1			1

F = A . C' + B' . C

4) $F = \Pi_3 M_i(0, 1, 4, 7)$

C \ A B	0 0	0 1	1 1	1 0
0	0			0
1	0		0	

F = (A+B).(B+C).(A'+B'+C')=
= (B+A.C).(B'+(A.C)') =
= B.(A.C)' + (A.C).B' = B ⊕ (A.C)

O BIEN:

C \ A B	0 0	0 1	1 1	1 0
0		1	1	
1		1		1

F = A'.B + B.C' + A.B'.C =
= B.(A'+C') + C.A.B' = B.(A.C)' + A.C.B' =
= B ⊕ (A.C)

OTRA RESPUESTA, para el primer caso:

F = (A+B).(B+C).(A'+B'+C') = (B + A.C).(A . B . C)’

5) Y= A’.B’.C’.D’+A’.B.C’.D’+A’.B+A’.B.C’.D+B

C D \ A B	0 0	0 1	1 1	1 0
0 0	1	1	1	
0 1		1	1	
1 1		1	1	
1 0		1	1	

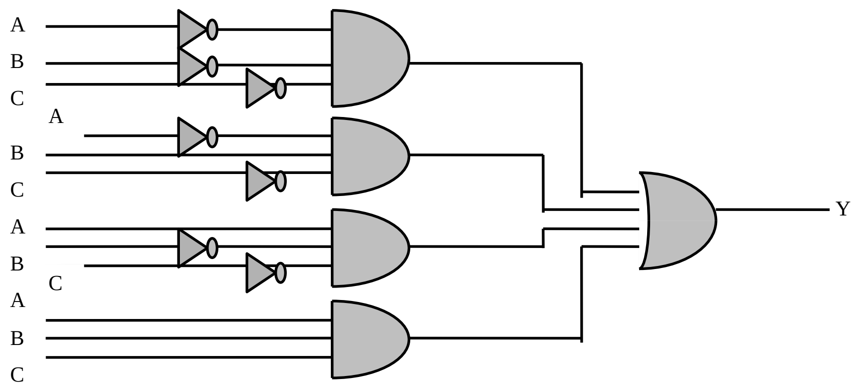
Y = B + A' .C'.D' = B + (A+C+D)'

6) Y = A.B.C’+A.B’.C.D+A.B’.C.D’+A’.B’.C.D+A’.C

C D \ A B	0 0	0 1	1 1	1 0
0 0			1	
0 1			1	
1 1	1	1		1
1 0	1	1		1

Y =A'.C + B'.C + A.B.C' =
= C.(A.B)' + C'.A.B =
= C ⊕ (A.B)

7)



Y = A’.B’.C’+A’.B.C’+A.B’.C’+A.B.C

C \ A B	0 0	0 1	1 1	1 0
0	1	1		1
1			1	

Y= B'.C' + A'.C' + A.B.C =

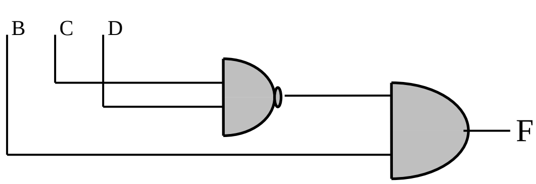
= (C ⊕ (A.B))'

8)F = Σ_4 m_i (4, 5, 6, 12, 13, 14) , y dibujar el circuito mínimo.

C D \ A B	0 0	0 1	1 1	1 0
0 0		1	1	
0 1		1	1	
1 1				
1 0		1	1	

F = B.C' + B.D' =B. (C' + D') =

= B. (C.D)'



9) F = A’.B’.C’.D’+A’.B’.C’.D+A’.B.C.D’+A’.B.C.D+A.B.C

CD \ AB	0 0	0 1	1 1	1 0
0 0	1			
0 1	1			
1 1		1	1	
1 0		1	1	

F = B.C + A'.B'.C'
= BC + (A+B+C)’

10)Y= A’.B’.C’.D’+A’.B+A’.B’.C.D+B’+A’.B.C’.D’

CD \ AB	0 0	0 1	1 1	1 0
0 0	1	1		1
0 1	1	1		1
1 1	1	1		1
1 0	1	1		1

Y = B’ + A' = (B . A)’

11) F= $\Sigma_4 m_i$ (0,1,3,4,5,7,11,15)

CD \ AB	0 0	0 1	1 1	1 0
0 0	1	1		
0 1	1	1		
1 1	1	1	1	1
1 0				

F = C . D + A' . C' = (A + C)’ + C . D

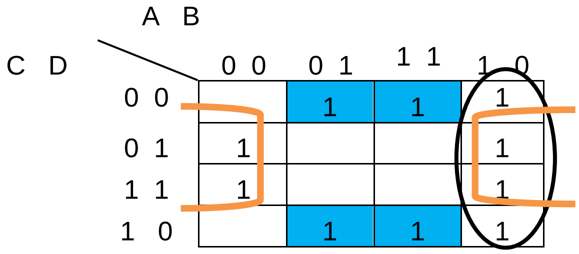
12) F= $\Pi_4 M_i$ (0,2,5,7,13,15)

CD \ AB	0 0	0 1	1 1	1 0
0 0	0			
0 1		0	0	
1 1		0	0	
1 0	0			

F = (B’+D’) . (A+B+D)
= (B . D)’ . (A+B+D)

O bien: F = A.B’+A.D’+B.D’+D.B’ = (por 9a) = A.B’+B.D’+D.B’= A.B’+(B ⊕D)

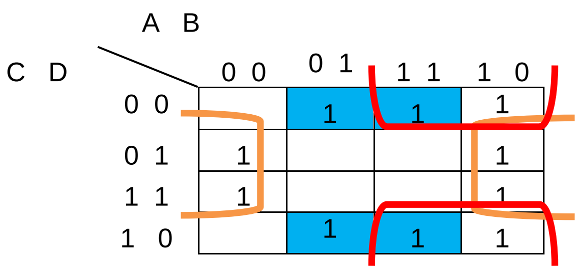
Otra forma de resolverlo:



F = A.B’ + B.D’ + B’.D = (I) = A.B’+(B ⊕D)

(II) = B’. (A+ D) + B . D’

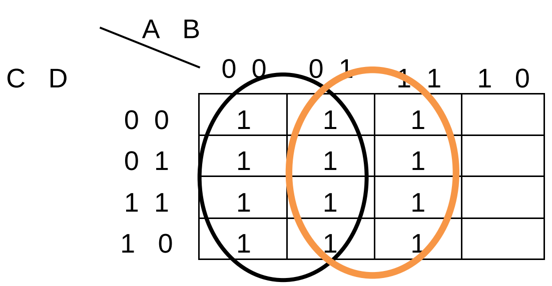
También podría ser:



F = B . D’ + B’ . D + A . D’ = (I) = A . D’ + (B ⊕ D)

(II) = D’ . (A + B) + B’ . D

13) Y= A’.B’.C’.D’+A’.B’.C’.D+A’.B’+A’.B’.C.D+B



Y = A´+ B

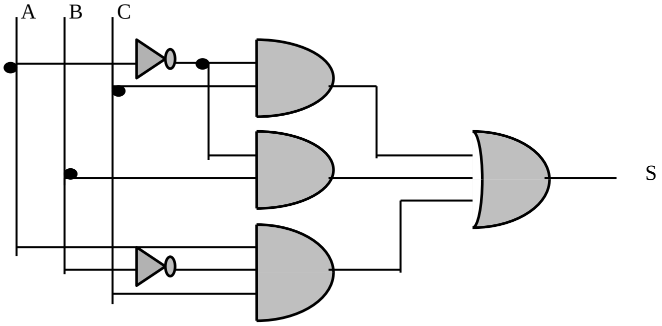
Trabajando con “0” ➔ Y = A’ + B

14) F= A’.B’.C’.D+A’.B.C’.D+A’.B+A’.B.D’+A’.B.C’+D

CD \ AB	0 0	0 1	1 1	1 0
0 0		1		
0 1	1	1	1	1
1 1	1	1	1	1
1 0		1		

F = A´. B + D

15)



S= A’.C+A’.B+A.B´.C

C \ AB	0 0	0 1	1 1	1 0
0		1		
1	1	1		1

S = A'.B + B'.C

16) Y= A’.B’C’.D+A’.B’.C.D+A’.B.C’.D+A’.B.C.D+A’.B.C

CD \ AB	0 0	0 1	1 1	1 0
0 0				
0 1	1	1		
1 1	1	1		
1 0		1		

Y = A´. D + A' . B . C = A’. (D + B . C)

17)

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

C \ A B	0 0	0 1	1 1	1 0
0	1		1	
1		1	1	1

$F = A'.B'.C' + A.B + B.C + A.C$

$F = A.B + C.(A+B) + C'(A+B)' = A.B + (C \oplus (A+B))'$

O bien: $F = A'.B'.C' + A.B + B.C + A.C = B'.A'.C' + B(A + C) + A.C =$

$= B'.A'.C' + B(A'.C')' + A.C = B \oplus (A'.C') + A.C =$

$= [B \oplus (A + C)'] + A.C$

Trabajando con los “0”:

C \ A B	0 0	0 1	1 1	1 0
0		0		0
1	0			

$F = (A + B' + C) . (A' + B + C) . (A + B + C')$

No se logró minimizar. Hay que trabajarlo con lógica de Boole.

(I) $= [A + (B + C') . (B' + C)] . (A' + B + C) =$

$= [A + B . C + B'.C'] . (A' + B + C) = [A + (B \oplus C)'] . (A' + B + C)$

(II) $= (A + B + C') . [C + (A + B') . (A' + B)] =$

$= (A + B + C') . [C + A.B + B'.A'] = (A + B + C') . [C + (A \oplus B)']$

(III) $= [A + (B + C') . (B' + C)] . [C + (A + B') . (A' + B)] =$

$= [A + B . C + B'.C'] . [C + A.B + B'.A'] =$

$= [A + (B \oplus C)'] . [C + (A \oplus B)']$

18) F= B. C. D+ A’. B’.C’. D + A’.B’.C’.D’+B´.C. D

CD \ AB	0 0	0 1	1 1	1 0
0 0	1			
0 1	1			
1 1	1	1	1	1
1 0				

F = C. D + A'. B'. C'
= C. D + (A + B + C)'

19) F= A’.B’.C’+A.B.C.D+B.C’.D+A’.C.D+A.B’.D+B.C’.D

CD \ AB	0 0	0 1	1 1	1 0
0 0	1			
0 1	1	1	1	1
1 1	1	1	1	1
1 0				

F = D + A'. B'.C'
= D + (A + B + C)'

Trabajando con los “0”:

CD \ AB	0 0	0 1	1 1	1 0
0 0		0	0	0
0 1				
1 1				
1 0	0	0	0	0

F = (C’ + D) . (A’ + D) . (B’ + D) = D + (C’ . A’ . B’) = D + (C + A + B)’

20) Dada la siguiente tabla, construir la tabla de verdad completa. Minimizarla. Dibujar circuito mínimo:

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

RTA.:

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

C \ A B	0 0	0 1	1 1	1 0
0	1			1
1	1			

F = A'.B' + B'.C' =

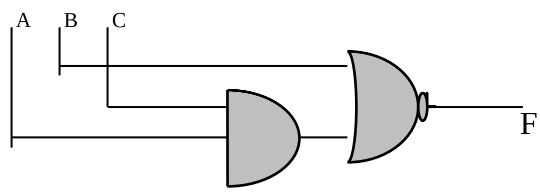
= B' . (A' + C') = B' . (A . C)' =

= (B + (A . C))'

Trabajando con los ceros:

C \ A B	0 0	0 1	1 1	1 0
0		0	0	
1		0	0	0

F = B' . (A'+ C') = B' . (A . C)' = [B + (A.C)]'



21) F= A'. B'. C' .D'+A. B'.C'. D' + A'. B'.C. D'+A. B'.C. D'

C D \ A B	0 0	0 1	1 1	1 0
0 0	1			1
0 1				
1 1				
1 0	1			1

F = B' . D' = (B + D)'