

Problemes



Introducción a los circuitos lógicos

Colección de problemas. Soluciones

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Assignatura: Electrònica digital

Titulació: Grau en Enginyeria de Sistemes Audiovisuals

Curs: 1r Quadrimestre: 2n

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2016



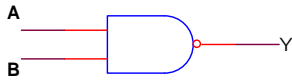
Soluciones Tema 1

Ejercicio 1.

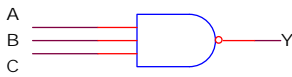
- a) $Y = A \cdot B + B \cdot C + \overline{A} \cdot \overline{B} \quad / \quad Y = A \cdot B + \overline{A} \cdot C + \overline{A} \cdot \overline{B}$
b) $Y = \overline{A} \cdot C + B \cdot \overline{C}$
c) $Y = B \cdot C$
d) $Y = \overline{A} \cdot B \cdot \overline{D} + A \cdot \overline{B} \cdot \overline{D} + \overline{A} \cdot \overline{B} \cdot C + A \cdot B \cdot C$

Ejercicio 2.

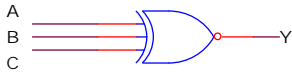
a) $Y = \overline{A \cdot B}$



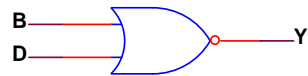
b) $Y = \overline{A \cdot B \cdot C}$



c) $Y = \overline{A \oplus B \oplus C}$



d) $Y = \overline{B + D}$



Ejercicio 3.

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

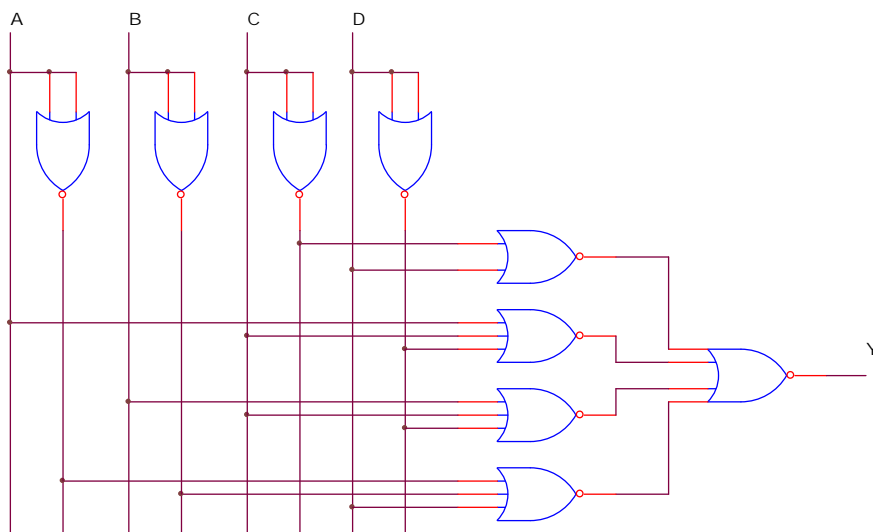
b) $Y = \overline{A} \cdot \overline{B} \cdot \overline{C} \cdot \overline{D} + \overline{A} \cdot \overline{B} \cdot C \cdot D + \overline{A} \cdot B \cdot \overline{C} \cdot \overline{D} + \overline{A} \cdot B \cdot C \cdot D + A \cdot \overline{B} \cdot \overline{C} \cdot \overline{D} + A \cdot \overline{B}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

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

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

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

e)



Ejercicio 4.

a)

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

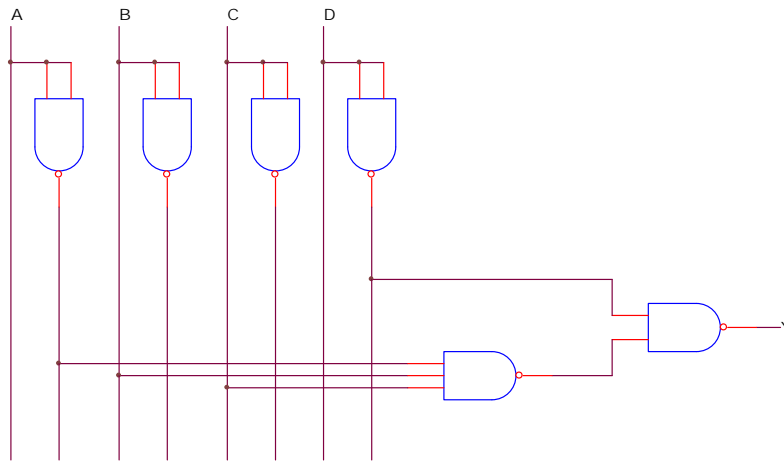
b) $Y = \overline{A} \cdot B \cdot C + D$

AB \ CD	00	01	11	10
00	0	0	0	0
01	1	1	1	1
11	1	1	1	1
10	0	1	0	0

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

AB \ CD	00	01	11	10
00	0	0	0	0
01	1	1	1	1
11	1	1	1	1
10	0	1	0	0

d)



Ejercicio 5.

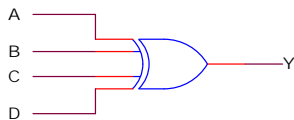
a) $Y = \bar{A}\cdot\bar{B}\cdot\bar{C}\cdot D + \bar{A}\cdot\bar{B}\cdot C\cdot\bar{D} + \bar{A}\cdot B\cdot\bar{C}\cdot\bar{D} + \bar{A}\cdot B\cdot C\cdot D + A\cdot\bar{B}\cdot\bar{C}\cdot\bar{D} + A\cdot\bar{B}\cdot C\cdot D + A\cdot B\cdot\bar{C}\cdot D + A\cdot B\cdot C\cdot\bar{D}$

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

c) $Y = \bar{A}\cdot\bar{B}\cdot\bar{C}\cdot D + \bar{A}\cdot\bar{B}\cdot C\cdot\bar{D} + \bar{A}\cdot B\cdot\bar{C}\cdot\bar{D} + \bar{A}\cdot B\cdot C\cdot D + A\cdot\bar{B}\cdot\bar{C}\cdot\bar{D} + A\cdot\bar{B}\cdot C\cdot D + A\cdot B\cdot\bar{C}\cdot D + A\cdot B\cdot C\cdot\bar{D}$

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

e)



Ejercicio 6.

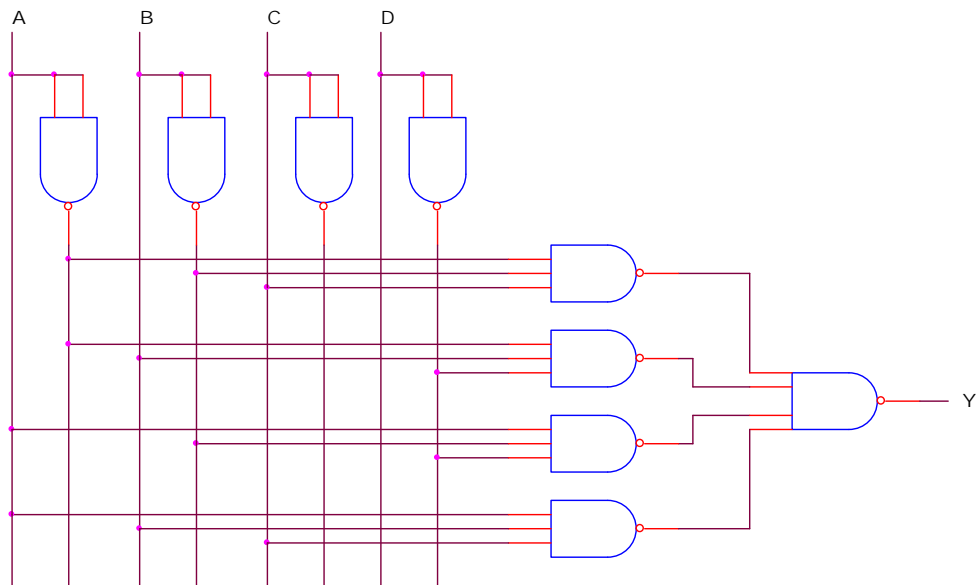
a) $Y = \bar{A}\cdot\bar{B}\cdot C\cdot\bar{D} + \bar{A}\cdot\bar{B}\cdot C\cdot D + \bar{A}\cdot B\cdot\bar{C}\cdot\bar{D} + \bar{A}\cdot B\cdot C\cdot\bar{D} + A\cdot\bar{B}\cdot\bar{C}\cdot\bar{D} + A\cdot\bar{B}\cdot C\cdot\bar{D} + A\cdot B\cdot\bar{C}\cdot\bar{D} + A\cdot B\cdot C\cdot D$

b) $Y = \bar{A}\cdot\bar{B}\cdot C + \bar{A}\cdot B\cdot\bar{D} + A\cdot\bar{B}\cdot\bar{D} + A\cdot B\cdot C$

c) $Y = \bar{A}\cdot\bar{B}\cdot C + \bar{A}\cdot B\cdot\bar{D} + A\cdot\bar{B}\cdot\bar{D} + A\cdot B\cdot C$

AB \ CD	00	01	11	10
00	0	1	0	1
01	0	0	0	0
11	1	0	1	0
10	1	1	1	1

d)



Ejercicio 7.

a)

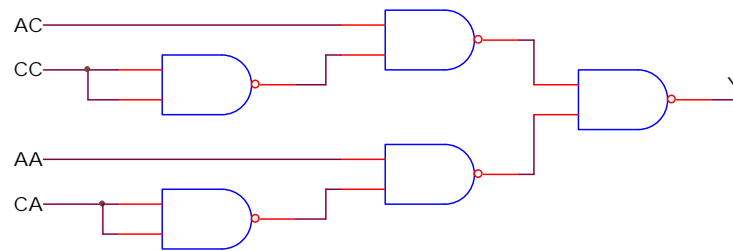
CC	CA	AC	AA	Y
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

b) $Y = AC\overline{CC} + AA\overline{CA}$

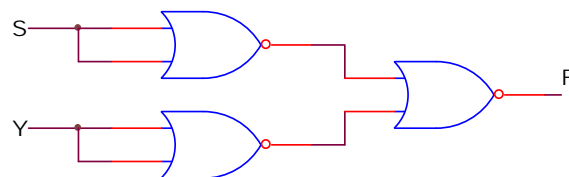
AC AA		CC CA			
		00	01	11	10
00	00	0	0	0	0
01	00	1	0	0	1
11	00	1	1	0	1
10	00	1	1	0	0

c) $F = S \cdot Y$

d)



e)



Ejercicio 8.

a)

A	B	C	D	Y
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	X
0	1	0	0	0
0	1	0	1	X
0	1	1	0	X
0	1	1	1	1
1	0	0	0	0
1	0	0	1	X
1	0	1	0	X
1	0	1	1	1
1	1	0	0	X
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

b) En este caso solamente seleccionamos los minterms correspondientes a las combinaciones en las que la función vale '1'.

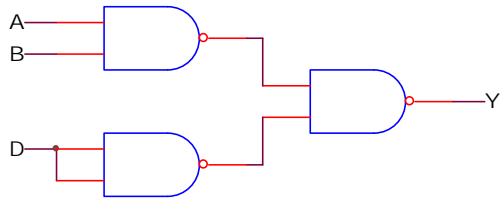
$$Y = \bar{A}\bar{B}\bar{C}D + \bar{A}B\bar{C}D + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + A\bar{B}C\bar{D} + A\bar{B}C\bar{D}$$

c) Asignaremos valores a las 'X' para obtener simplificar al máximo la función.

$$Y = A\cdot B + D$$

AB \ CD	00	01	11	10
00	0	0	X	0
01	1	X	1	X
11	X	1	1	1
10	0	X	1	X

d)



Ejercicio 9.

a)

N	S	E	O	a	b	c	d	e	f	g
0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	1	1	0
0	0	1	0	0	1	1	0	0	0	0
0	0	1	1	X	X	X	X	X	X	X
0	1	0	0	0	0	0	1	0	0	0
0	1	0	1	0	0	0	1	1	0	0
0	1	1	0	0	0	1	1	0	0	0
0	1	1	1	X	X	X	X	X	X	X
1	0	0	0	1	0	0	0	0	0	0
1	0	0	1	1	0	0	0	0	1	0
1	0	1	0	1	1	0	0	0	0	0
1	0	1	1	X	X	X	X	X	X	X
1	1	0	0	X	X	X	X	X	X	X
1	1	0	1	X	X	X	X	X	X	X
1	1	1	0	X	X	X	X	X	X	X
1	1	1	1	X	X	X	X	X	X	X

b)

a = N

NS \ EO	00	01	11	10
00	0	0	X	1
01	0	0	X	1
11	X	X	X	X
10	0	0	X	1

b = $\bar{S} \cdot E$

NS \ EO	00	01	11	10
00	0	0	X	0
01	0	0	X	0
11	X	X	X	X
10	1	0	X	1

c = $\bar{N} \cdot E$

NS \ EO	00	01	11	10
00	0	0	X	0
01	0	0	X	0
11	X	X	X	X
10	1	1	X	0

$$d = S$$

NS \ EO	00	01	11	10
00	0	1	X	0
01	0	1	X	0
11	X	X	X	X
10	0	1	X	0

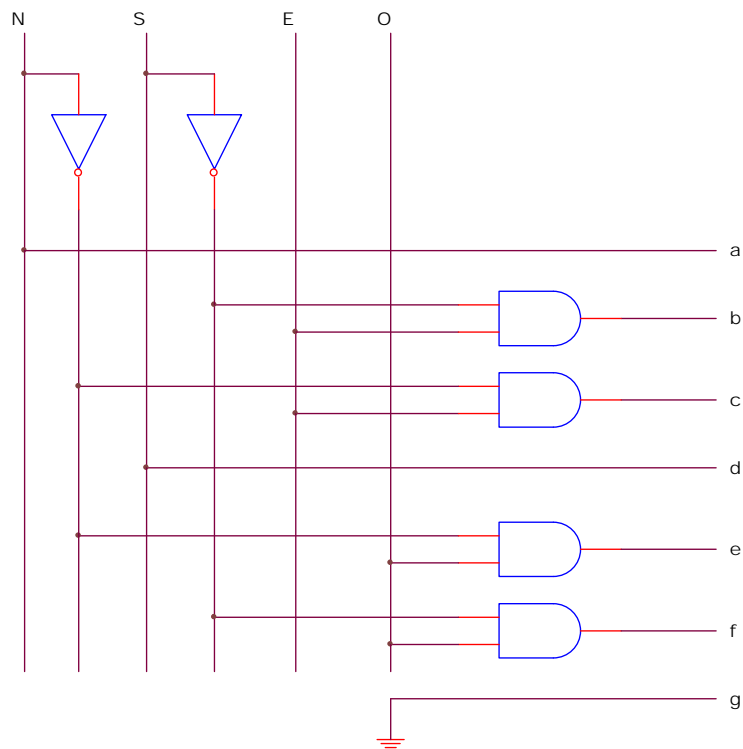
$$e = \bar{N} \cdot O$$

NS \ EO	00	01	11	10
00	0	0	X	0
01	1	1	X	0
11	X	X	X	X
10	0	0	X	0

$$f = \bar{S} \cdot O$$

NS \ EO	00	01	11	10
00	0	0	X	0
01	1	0	X	1
11	X	X	X	X
10	0	0	X	0

c)



Ejercicio 10.

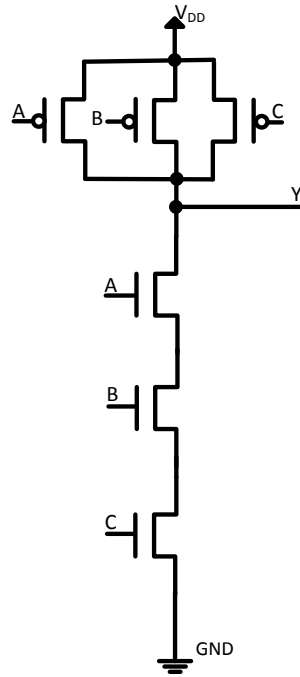
a)

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

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

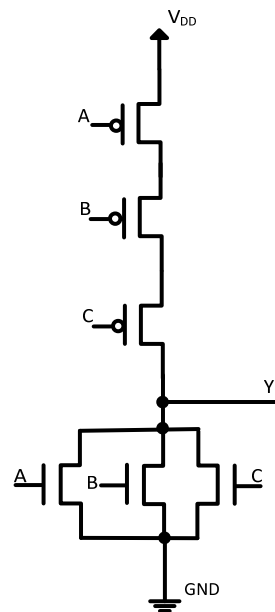
Ejercicio 11.

$$Y = \overline{A + B + C} = \overline{A \cdot B \cdot C}$$



Ejercicio 12.

$$Y = \overline{A \cdot B \cdot C} = \overline{A + B + C}$$



Ejercicio 13.

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

