1. Representar la función en sus dos modelos canónicos. Minimizar la función y dibujar el circuito

Minimizar la función

$$f(abcd) = \overline{ab}\left(\overline{\bar{c} + a\bar{d}}\right) + \bar{a}\left(\overline{b\bar{d}} + d\right)$$

$f(abcd) = \overline{ab}\left(\overline{\bar{c} + a\bar{d}}\right) + \bar{a}\left(\overline{b\bar{d}} + d\right)$ Ley de Morgan

$f(abcd) = \left(\bar{a} + \bar{b}\right)\left(\bar{\bar{c}}\left(\bar{a} + \bar{\bar{d}}\right)\right) + \bar{a}\left(\left(\bar{b} + \bar{d}\right) + d\right)$ Doble Negación

$f(abcd) = \left(\bar{a} + \bar{b}\right)\left(c(\bar{a} + d)\right) + \bar{a}\left(\left(\bar{b} + \bar{d}\right) + d\right)$ Acomodar

$f(abcd) = \left(\bar{a} + \bar{b}\right)(c\bar{a} + cd) + \bar{a}\left(\bar{b} + \bar{d} + d\right)$ $\bar{d} + d = 1$

$f(abcd) = \left(\bar{a} + \bar{b}\right)(c\bar{a} + cd) + \bar{a}\left(\bar{b} + 1\right)$ $\bar{b} + 1 = 1$

$f(abcd) = \left(\bar{a} + \bar{b}\right)(c\bar{a} + cd) + \bar{a}(1)$ $\bar{a}(1) = \bar{a}$

$f(abcd) = \left(\bar{a} + \bar{b}\right)(c\bar{a} + cd) + \bar{a}$ Distributividad

$f(abcd) = \left(c\bar{a}\bar{a} + c\bar{a}\bar{b}\right) + \left(cd\bar{b} + \bar{a}cd\right) + \bar{a}$ $\bar{a}\bar{a} = \bar{a}$

$f(abcd) = c\bar{a} + c\bar{a}\bar{b} + cd\bar{b} + \bar{a}cd + \bar{a}$ Distributividad

$f(abcd) = \bar{a}\left(c + c\bar{b} + cd + 1\right) + cd\bar{b}$ $\left(c + c\bar{b} + cd + 1\right) = 1$

$f(abcd) = \bar{a}(1) + cd\bar{b}$ $\bar{a}(1) = \bar{a}$

$f(abcd) = \bar{a} + \bar{b}cd$

Expresar la función en sus dos modelos canónicos (Encontrar los minterminos y maxterminos)

MINTERMINOS

$f(abcd) = \bar{a} + \bar{b}cd$ Multiplicar por $\left(b + \bar{b}\right) \wedge (a + \bar{a})$

$f(abcd) = \bar{a}\left(b + \bar{b}\right) + \bar{b}cd(a + \bar{a})$

$f(abcd) = \bar{a}b + \bar{a}\bar{b} + a\bar{b}cd + \bar{a}\bar{b}cd$ Multiplicar por $(c + \bar{c})$

$f(abcd) = \left(\bar{a}b + \bar{a}\bar{b}\right)(c + \bar{c}) + a\bar{b}cd + \bar{a}\bar{b}cd$

$f(abcd) = \left(\bar{a}bc + \bar{a}\bar{b}c + \bar{a}b\bar{c} + \bar{a}\bar{b}\bar{c}\right) + a\bar{b}cd + \bar{a}\bar{b}cd$ Multiplicar por $\left(d + \bar{d}\right)$

$f(abcd) = \left(\bar{a}bc + \bar{a}\bar{b}c + \bar{a}b\bar{c} + \bar{a}\bar{b}\bar{c}\right)\left(d + \bar{d}\right) + a\bar{b}cd + \bar{a}\bar{b}cd$

$f(abcd) = \bar{a}bcd + \bar{a}\bar{b}cd + \bar{a}b\bar{c}d + \bar{a}\bar{b}\bar{c}d + \bar{a}bc\bar{d} + \bar{a}\bar{b}c\bar{d} + \bar{a}b\bar{c}\bar{d} + \bar{a}\bar{b}\bar{c}\bar{d} + a\bar{b}cd + \bar{a}\bar{b}cd$

Representar en números

0111	0011	0101	0101	0001	0110	0010	0100	1001	0000	1011	0011
7	3	5	5	1	6	4	2	9	0	11	3

$\therefore \sum(0,1,2,3,4,5,6,7,9,11)$

MAXTERMINOS

$f(abcd) = \bar{a} + \bar{b}cd$ Asociativa

$f(abcd) = (\bar{a} + \bar{b})(\bar{a} + c)(\bar{a} + d)$ Sumar $c\bar{c}$

$f(abcd) = (\bar{a} + \bar{b} + (c\bar{c}))(\bar{a} + c)(\bar{a} + d + (c\bar{c}))$

$f(abcd) = (\bar{a} + \bar{b} + c)(\bar{a} + \bar{b} + \bar{c})(\bar{a} + c)(\bar{a} + d + c)(\bar{a} + d + \bar{c})$ Sumar $b\bar{b}$

$f(abcd) = (\bar{a} + \bar{b} + c)(\bar{a} + \bar{b} + \bar{c})(\bar{a} + c + (b\bar{b}))(\bar{a} + d + c + (b\bar{b}))(\bar{a} + d + \bar{c} + (b\bar{b}))$

$f(abcd) = (\bar{a} + \bar{b} + c)(\bar{a} + \bar{b} + \bar{c})(\bar{a} + b + c)(\bar{a} + \bar{b} + c)(\bar{a} + b + c + d)(\bar{a} + \bar{b} + c + d)(\bar{a} + b + d + \bar{c})(\bar{a} + \bar{b} + d + \bar{c})$ Sumar $d\bar{d}$

$f(abcd) = (\bar{a} + \bar{b} + c + d\bar{d})(\bar{a} + \bar{b} + \bar{c} + d\bar{d})(\bar{a} + b + c + d\bar{d})(\bar{a} + \bar{b} + c + d\bar{d})(\bar{a} + b + c + d)(\bar{a} + \bar{b} + c + d)(\bar{a} + b + d + \bar{c})(\bar{a} + \bar{b} + d + \bar{c})$

$f(abcd) = (\bar{a} + \bar{b} + c + d)(\bar{a} + \bar{b} + c + \bar{d})(\bar{a} + \bar{b} + \bar{c} + d)(\bar{a} + \bar{b} + \bar{c} + \bar{d})(\bar{a} + b + c + d)(\bar{a} + \bar{b} + c + d)(\bar{a} + \bar{b} + c + \bar{d})(\bar{a} + b + c + d)(\bar{a} + \bar{b} + c + d)(\bar{a} + b + \bar{c} + d)(\bar{a} + \bar{b} + \bar{c} + d)$

Representar en números

Recordar $a = 0 \wedge \bar{a} = 1$

$(1100)(1101)(1110)(1111)(1000)(1001)(1100)(1101)(1000)(1100)(1010)(1110)$

Convertir

12	13	14	15	8	9	12	13	8	12	10	14

$\therefore \prod(8,9,10,12,13,14,15)$

Dibujar el Circuito

$$f(abcd) = \bar{a} + \bar{b}cd$$