

Minimizar las siguientes funciones como sumas de términos producto (2.5) y como producto de términos suma (2.6):

- I. $f_1(a, b, c, d) = \sum m(0, 2, 6, 11, 13, 14) + \sum d(1, 3, 9)$
 $\bar{a}\bar{b} + \bar{b}d + a\bar{c}d + bc\bar{d} \qquad (\bar{a} + b + d)(\bar{b} + \bar{c} + \bar{d})(a + \bar{d})(\bar{b} + c + d)$
- II. $f_2(a, b, c, d) = \sum m(0, 2, 4, 5, 13)$
 $b\bar{c}d + \bar{a}b\bar{d} + \bar{a}\bar{c}\bar{d} \quad \circ \text{ bien} \qquad (\bar{a} + d)(b + \bar{d})(\bar{b} + \bar{c})$
 $\bar{b}\bar{c}d + \bar{a}\bar{b}\bar{d} + \bar{a}b\bar{c}$
- III. $f_3(a, b, c, d) = \sum m(3, 5, 6, 7, 10, 11, 13, 14, 15) + \sum d(4, 9)$
 $cd + ac + \bar{a}b + bd \quad \circ \text{ bien}$
 $cd + ac + \bar{a}b + ad \quad \circ \text{ bien} \qquad (c + d)(b + c)(a + b + d)$
 $cd + ac + bd + bc$
- IV. $f_4(a, b, c, d) = \sum m(0, 1, 2, 4, 8, 9, 10) + \sum d(3, 5)$
 $\bar{a}\bar{c} + \bar{b}\bar{c} + \bar{b}\bar{d} \qquad (\bar{a} + \bar{b})(\bar{c} + \bar{d})(\bar{b} + \bar{c})$
- V. $f_5(a, b, c, d) = \sum m(0, 1, 8) + \sum d(2, 5, 7, 10, 11, 14, 15)$
 $\bar{b}\bar{d} + \bar{a}b\bar{c} \quad \circ \text{ bien} \qquad \bar{b} \cdot \bar{c} \cdot (\bar{a} + \bar{d})$
 $\bar{b}\bar{d} + \bar{a}\bar{c}d$
- VI. $f_6(a, b, c, d) = \sum m(0, 1, 2, 3, 8, 14) + \sum d(4, 5, 6, 7, 9)$
 $\bar{a} + \bar{b}\bar{c} + bc\bar{d} \qquad (\bar{b} + c)(\bar{a} + b + \bar{c})(\bar{b} + \bar{d}) \quad \circ \text{ bien}$
 $\qquad (\bar{b} + c)(\bar{a} + b + \bar{c})(\bar{a} + \bar{d})$
- VII. $f_7(a, b, c, d) = \sum m(1, 4, 5, 10, 11, 12, 13) + \sum d(3, 6, 14)$
 $b\bar{c} + \bar{a}\bar{b}c + \bar{a}\bar{b}d \quad \circ \text{ bien} \qquad (\bar{b} + \bar{c})(\bar{a} + b + c)(a + b + d)$
 $\bar{b}\bar{c} + \bar{a}\bar{b}c + \bar{a}\bar{c}d$
- VIII. $f_8(a, b, c, d) = \sum m(0, 2, 4, 8, 10) + \sum d(1, 9)$
 $\bar{b}\bar{d} + \bar{a}\bar{c}\bar{d} \qquad \bar{d} \cdot (\bar{a} + \bar{b})(\bar{b} + \bar{c})$
- IX. $f_9(a, b, c, d, e) = \sum m(0, 4, 9, 16, 20, 25, 29) + \sum d(2, 6, 18, 22)$
 $\bar{b}\bar{c}e + b\bar{c}d\bar{e} + ab\bar{d}e \qquad \bar{d} \cdot (b + \bar{e})(\bar{b} + e)(a + \bar{c} + \bar{e}) \quad \circ \text{ bien}$
 $\qquad \bar{d} \cdot (b + \bar{e})(\bar{b} + e)(a + \bar{b} + \bar{c})$
- X. $f_{10}(a, b, c, d, e) = \sum m(1, 6, 17, 18, 19, 22, 23) + \sum d(2, 3, 27, 31)$
 $\bar{b}\bar{c}e + \bar{b}d\bar{e} + ade \quad \circ \text{ bien} \qquad \bar{b} \cdot (\bar{c} + d)(d + e)(a + \bar{d} + \bar{e}) \quad \circ \text{ bien}$
 $\bar{b}\bar{c}e + \bar{b}d\bar{e} + \bar{a}b\bar{d} \qquad \bar{b} \cdot (\bar{c} + d)(d + e)(a + \bar{c} + \bar{e})$