DEI
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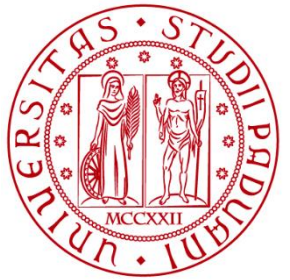

UNIVERSITÀ
DEGLI STUDI
DI PADOVA

Digital Systems

Exercises on Boolean Algebra and Karnaugh Maps

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Degree Course in Information Engineering

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Exercise 1: Express the following function F in optimized SOP form

$$F(a,b,c,d) = \begin{cases} 1 \text{ if } abcd \text{ is a prime number (or if } abcd \text{ is equal to 1)} \\ 0 \text{ otherwise} \end{cases}$$

Exercise 2: Find the 2-levels optimized SOP form for the following function G

$$G(w, x, y, z) = \sum m(0, 1, 2, 3, 4, 5, 7, 14, 15)$$

Exercise 3: 1) Is the following function expressed in 2-level optimized SOP form?

$$F(a, b, c, d) = \bar{a}c + \bar{a}b + bd + cd$$

2) Find the 2-level optimized POS form of the function F

Exercise 4: Use 4 binary digits (*dcba*) to represent decimal numbers from 0 to 9 (BCD). Implement the function in SOP form:

$$F(d,c,b,a) = \begin{cases} 1 \text{ if } dcba \text{ is not zero and multiple of 3} \\ 0 \text{ otherwise} \end{cases}$$

Esercizio 5: Find the optimized SOP form for the 4-input function with the following minterms:

$m_0, m_1, m_2, m_4, m_5, m_{10}, m_{11}, m_{13}, m_{15}$

Exercise 6: Optimize the following function in 2-level SOP and POS forms

$$F(a,b,c,d) = \prod M(2,5,6,7,8,9,10,11,14)$$