

DEVELOPMENT OF DIGITAL SYSTEMS

Midterm Examination
06. 12. 2011

1. Determine the "sum-of-products" (SOP) and "product-of-sums" (POS) representation of a given function f using Boolean algebra.

$$f(x_1, x_2, x_3, x_4) = (x_1 \downarrow x_2) \cdot \overline{x_3} + ((\overline{x_2} \equiv x_4) \downarrow \overline{x_1})$$

2. Can a given function f be expressed as a linear function:

$$f(x_1, x_2, x_3, x_4) = k_0 \oplus k_1 \cdot x_1 \oplus k_2 \cdot x_2 \oplus k_3 \cdot x_3 \oplus k_4 \cdot x_4$$

- If it can be expressed, determine the coefficients k_0, k_1, k_2, k_3, k_4 .
- If it can not be expressed, explain why.

$$f^4 = V(0, 3, 4, 7, 9, 10, 13, 14)$$

3. Implement the incompletely specified function f using a single 4/1 multiplexer using Shannon's expansion theorem.

$$f(x_1, x_2, x_3, x_4) = \&(1, 5, 7 - 9, 11, 12) \text{ in } \&_x(3, 4, 10, 15)$$

4. Convert the number 123_{10} (01111011_2) into BCD representation using "double dabble" algorithm.

Examination duration is 60 minutes. Each assignment is worth 10 points.

Please sign your answer sheet using your enrollment number. Solutions will be published on the course web page.

Examination results will be announced on: <https://estudent.fri.uni-lj.si/>