Lehrstuhl für Telematik · Universität Göttingen
http://www.ifi.informatik.uni-goettingen.de/tmg
Lotzestr. 16–18 · D–37083 Göttingen

Exercises for "Computer Science II" — SS 2003

No. 2

Due: May 17, 2003

Number Systems

1. Convert the following numbers from one notation to another; intermediate steps are necessary. **(2 points)**
   Example: $555_{10} = 512 + 32 + 8 + 2 + 1 = 1000101011_2$

   $10110001011010_2 =$ _____ 16

   $1ED5_{16} =$ _____ 8

   $11001.101_2 =$ _____ 10

   $10101.111_2 =$ _____ 10

   $555_8 =$ _____ 10

   $219_{10} =$ _____ 2

   $43.375_{10} =$ _____ 2

   $2^{26} =$ _____ 10

Gate-Level Circuit Design

2. For each expression below, create a gate level implementation using only the specified types of gate. Use mixed logic notation (i.e., bubbled output go to bubbled inputs and non-bubbled outputs go to non-bubbled inputs). Do not assume you have the complements of the inputs. **(3 points)**

   a) $f = xy + yz$ using only NAND and OR gates

   b) $f = x + yz$ using only NOT, NAND and OR gates

   c) $f = (A + B)(C + D)$ using only NOR and AND gates

Simplification of Boolean Expressions

3. For the truth table as shown in Fig. 1, give the minterm sum of product equation, and simplify the expresson using Boolean algebra. **(2 points)**

x	y	z	F(x,y,z)
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

Figure 1: A truth table

K-Maps

4. A desired logical function is specified in the Karnaugh map as shown in Fig. 2. Write the original expression and simplified sum of products (SOP) expression. Implement your SOP using AND, OR gates and inverters. **(3 points)**

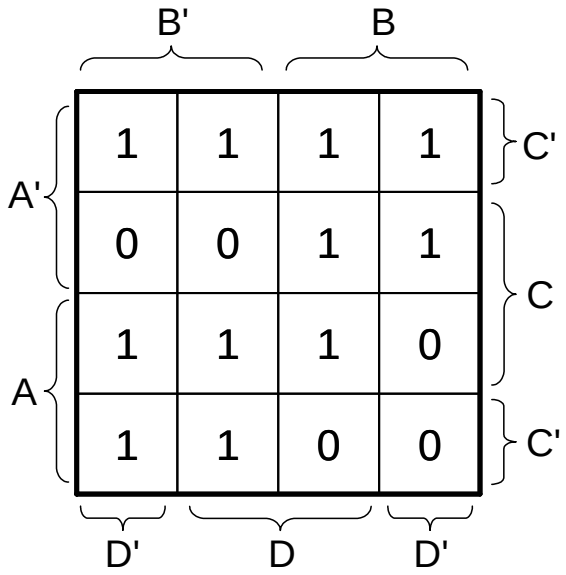

Figure 2: A Karnaugh map