Institut for Matematik og Datalogi
Syddansk Universitet

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JFB

Introduction to Computer Science
E14 – Discussion Sections 2 – Week 37

1. Produce formulas and circuits for the following functions:

(a)

w	x	y	z
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

(b)

w	x	y	z
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

(c)

a	b	c	d	z
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	0
1	1	1	1	0

(d)

a	b	c	d	z
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

2. Produce a truth table and circuit for the following function:

$$((x \wedge y) \vee (\bar{x} \wedge \bar{y})) \vee z$$

3. Discuss the ease or difficulty of going from a formula to a circuit, vs. the ease or difficulty of going from a circuit to a formula. Create a circuit where the corresponding formula would naturally be larger than the formula.

4. From the textbook, pages 60–61: Problems 1c, 2c, 3b, 4c, 5.

5. From the textbook, page 71: Problems 1b, 1c, 2b, 2d (for these problems use the floating-point format discussed in class, which is the same as in the textbook except that it uses an implicit bit in the mantissa).

6. From the textbook, page 84: Problem 39 (again use the format discussed in class).

7. Choose two floating point numbers and add them together. If you cannot express the result in the same format, try two other numbers.

8. Choose a number which cannot be expressed exactly in the floating point format we use, but could be expressed exactly if there were more bits. How many more bits do you need?