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Exercises for
Rechnerstrukturen
Winter Semester 2016

Exercise Sheet 4 (Block A - 4)

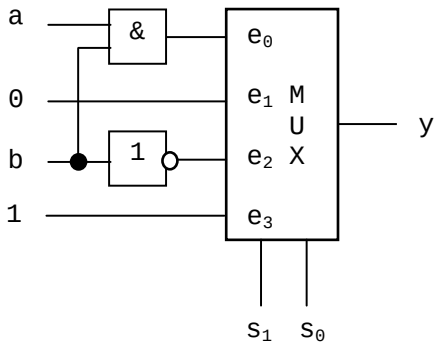
(16 points)

Submission until Wednesday, 23rd November 2016, 16:00o'clock
Discussion begins on Monday, 28th November 2016

Please see notes at the end of the document for the submission.

4.1 Multiplexer (4 points)

Consider the following combinatorial logic for a 4-to-1 Mulitplexer (MUX). The input ports e_1 and e_3 are set to 0 and 1, respectively. The other two input ports depend on the values of a and b. The control input ports are s_0 and s_1, where s_0 is the least significant bit and s_1 is the most significant bit. Write the output values of $y = f(s_1, s_0, a, b)$ for all the possible combinations of the input values s_1, s_0, a, b in the following table. Also, write the intermediate values of e_0 and e_2.



s_1	s_0	a	b	e_0	e_1	e_2	e_3	y
0	0	0	0					
0	0	0	1					
0	0	1	0					
0	0	1	1					
0	1	0	0					
0	1	0	1					
0	1	1	0					
0	1	1	1					
1	0	0	0					
1	0	0	1					
1	0	1	0					
1	0	1	1					
1	1	0	0					
1	1	0	1					
1	1	1	0					
1	1	1	1					

4.2 Floating Point Arithmetic (Addition / Subtraction) (4 points)

Given the following two 32-Bit Floating Point Numbers FPN1 and FPN2 according to the IEEE 754-1985 standard. Carry out the following calculation without converting the numbers to decimal! Give the result as shown below FPN2 (s=Signum, e=Exponent, m=Mantisse). You will get 1 point for the correct result. The other 3 points will be given if you present the steps of the calculation clearly.

	s	e	m
FPN1:	0	1000 0001	010 0101 0000 0000 0000 0000
FPN2:	1	1000 0101	111 1010 1000 0000 0000 0000

Calculate FPN1 - FPN2.

4.3 Floating Point Arithmetic (Multiplication) (4 points)

Given the following two 32-Bit Floating Point Numbers FPN1 and FPN2 according to the IEEE 754-1985 standard. Carry out the following calculation without converting the numbers to decimal! Give the result as shown below FPN2 (s=Signum, e=Exponent, m=Mantisse). You will get 1 point for the correct result. The other 3 points will be given if you present the steps of the calculation clearly.

	s	e	m	
FPN1:	0	1000 1100	010 1000 0000 0000 0000 0000	
FPN2:	1	0111 1101	101 0000 0000 0000 0000 0000	Calculate FPN1 · FPN2.

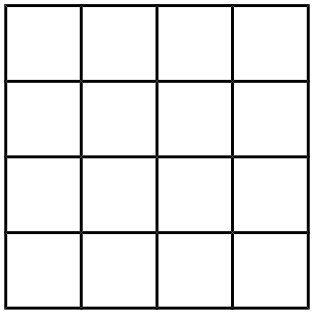
4.4 KV-Diagrams (4 points)

Consider functions $f_1 : B^4 \to B$ and $f_2 : B^4 \to B$ shown below with their respective vectors values. Draw the related KV-Diagrams. Use these KV-Diagrams to find ALL prime implicants of both functions and write down the corresponding monomials.

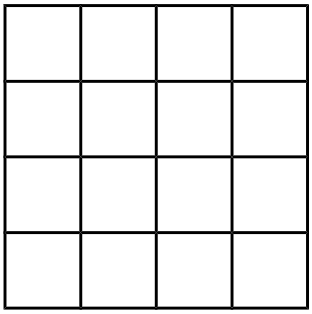
a. $f_1(x_1, x_2, x_3, x_4)$ is given by: (0,0,1,0, 1,1,1,1, 0,0,1,0, 1,1,1,1)

b. $f_2(x_1, x_2, x_3, x_4)$ is given by: (0,1,0,1, 1,1,1,1, 1,1,0,1, 1,0,1,0)

f_1



f_2



Notes:
Submission until Wednesday, 23rd November 2016, 16:00 pm in the mailbox number 40 at Otto-Hahn-Straße 12.

You can find the mailboxes in the first floor of the Otto-Hahn-Straße 12 near the transition to the ground floor of the Otto-Hahn-Straße 14. The mailboxes are labeled with “Rechnerstrukturen”, the exercise group number and time/place of the exercise. The English exercise group is number 31 and the mailbox is number 40.

Please write your **name**, your **student registration number** and your **exercise group number** at the top right corner of your submission. You can make submissions in teams with up to two more students. To make a team submission put names, student registrations numbers and group numbers of all members of the team on the submission. Only one submission per team has to be made.

Tack you submission. Please do not fold your submission and do not put it into an envelope. Use the correct mailbox, you will need your exercise group number for that.

In total there are 12 exercises in 3 blocks (A, B, C). In each block you have to achieve at least 30 points of 64 possible ones to get access to the exam.