Advanced Logic Design 2012
Assignment 2, 8 points, due 08/11

(1) **1 point** Consider the Boolean function $f : \{0,1\}^3 \to \{0,1,-\}$ which is defined by the following truth table:

a	b	c	f(a,b,c)
0	0	0	–
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

(1a) List on-set, don't care set and off-set of f as sets of cubes.

(1b) List on-set, don't care set and off-set of f in parallel encoding ((min,max) pairs).

(1c) List on-set, don't care set and off-set of f in sequential encoding.

(2) **2 points** Let c_1 be the cube $(1\ -\ -)$ and c_2 be the cube $(-\ 11)$. Using the parallel encoding ((min,max) pairs):

(2a) Compute the intersection of c_1 and c_2.

(2b) Compute the supercube of c_1 and c_2.

(2c) Check whether c_2 is contained in c_1.

(2d) Compute the complement of a union of c_1 and c_2.

For each case, explain which formula you have used and show all steps of the computation.

(3) **2 points** Repeat (2) for the sequential encoding.

(4) **1 point** Prove that $a+1=1$, $\forall a \in B$, for the Boolean algebra $(B;+,\cdot,';0,1)$, where $B=\{0,1\}$.

(5) **1 point** Prove that $a+a\cdot b=a$, $\forall a,b \in B$, for the Boolean algebra $(B;+,\cdot,';0,1)$, where $B=\{0,1\}$.

(6) **1 point** Check whether the following algebra $(B;+,\cdot,';\mathbf{0},\mathbf{1})$ is a Boolean algebra:

$B=\{0,1,2,3\}$
"$+$" is the maxim (the largest of two values)
"$\cdot$" is the minimum (the smallest of two values)
"$'$" is the complement dened by: $x'=(x+1) mod\ 4$, i.e. $0'=1,1'=2,2'=3,3'=0$.
0 = 0
1 = 3