## **Problem 4:**

Boolean algebra operations can be expressed as arithmetic operations mod 2. Let 1 represent true, and 0 false.

(a) Show that  $A \wedge B = (A \bullet B \mod 2)$ .

A	В	$A \wedge B$
T	T	T
Т	F	F
F	T	F
F	F	F

A	В	A • B mod 2
1	1	1
1	0	0
0	1	0
0	0	0

(b) What is  $\sim$ A?

A	$\sim$ A	A+1	A+1 mod 2
1	0	2	0
1	0	2	0
0	1	1	1
0	1	1	1

(c) What is A  $\vee$  B? (Use De Morgan's laws.)

- 1.  $A \lor B$
- 2.  $\sim$  ( $\sim$ A  $\wedge \sim$ B) [by De Morgan's Laws]
- 3.  $\sim$ (  $\sim$ A  $\sim$ B )mod2 [by Problem 4a]
- 4. ( ( A + 1 )  $mod2 \bullet$  ( B + 1 ) mod2 + 1 ) mod2 [by Problem 4b]