



BLG 231E - Digital Circuits Assignment 1

Due Date: 06.10.2016, Thursday, 17.00.

- Please **write neatly**.
- If you are not preparing your homework in a computer, please show complement of a symbol by putting a **dash** over the symbol (e.g. do not use x' use \bar{x}).
- **Consequences of plagiarism:** Disciplinary regulations of The Council of Higher Education and of the university are applied.
- **No late submissions** will be accepted.

Submissions: Please submit your solutions to the Digital Circuits Course Assignment Box at the department secretary's office.

Part 1 – Computer Arithmetic

1. Consider the given numbers $A : (153)_{10}$ and $B : (141)_{10}$
 - i. Represent the values of the given numbers in **8-bit unsigned** binary form
 - ii. Calculate the given arithmetic operations $A + B$ and $A - B$ in binary representation. Write your result in a **Hexadecimal** form and interpret them by using overflow, carry and borrow flags where they are valid.
2. Consider the given numbers $A : (-68)_{10}$ and $B : (-77)_{10}$
 - i. Represent the values of the given numbers in **8-bit signed** binary form
 - ii. Calculate the given arithmetic operations $A + B$ and $A - B$ in binary representation. Write your result in a **Hexadecimal** form and interpret them by using overflow, carry and borrow flags where they are valid.

Part 2 – Boolean Algebra

3. Simplify the following logical expressions by using the axioms, properties and theorems of the Boolean Algebra.
 - i. $[b \odot d] + abc + bcd + a\bar{b}\bar{d} + [a \oplus c] + a\bar{b}$
 - ii. $be + \bar{a}c\bar{d} + \bar{b}de + a\bar{b}c + ab\bar{e} + a\bar{b}\bar{c} + \bar{b}\bar{d}e$

Additional Information:

The definition of XOR (\oplus) and XNOR (\odot) operations are given below.

$$[x \oplus y] = \bar{x}y + x\bar{y}$$

$$[x \odot y] = \overline{[x \oplus y]} = \bar{x}\bar{y} + xy$$