02.10.2015

Istanbul Technical University
Department of Computer Engineering

BLG 231E - Digital Circuits
Assignment 1

Due Date: 08.10.2015, **Thursday,** 17.00.

- Please **write <u>neatly</u>**.
- 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.

1. Consider the given binary numbers A : 0111 1011 and B: 1000.

i. Assume these numbers are **unsigned**, calculate the given arithmetic operations $A + B$ and $A - B$.

ii. Assume these numbers are **signed**, calculate the given arithmetic operations $A + B$ and $A - B$.

Interpret the results of the operations by using overflow, carry and borrow flags where they are valid.

2. Simplfy the following logical expressions by using the axioms, properties and theorems of the Boolean Algebra.

i. $[a \oplus b \oplus c] + \overline{a}bc + a\overline{b}c$

ii. $ab\overline{c}d + \overline{a}b\overline{c}d + a\overline{b}d + \overline{b}c\overline{d} + \overline{a}\overline{b}d$

Additional Information:

The definition of XOR ($\oplus$) operation has ben given below.

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