



Istanbul Technical University
Department of Computer Engineering

4.10.2019

BLG 231E - Digital Circuits

Take-Home Exam 1

Due Date: 10.10.2019, **Thursday**, 16:00.

- Please write neatly.
- Please prepare your homework in a computer.
- **Consequences of plagiarism:** Any cheating will be subject to the University disciplinary proceedings.
- **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. **A** is an 8-bit binary integer **A = 01000011** and **B** is a 4-bit binary integer **B = 1010**. Answer the following questions. (Use **2's complement** system to represent negative numbers and for subtraction.)
 - a. If **A** and **B** are *signed* binary integers, perform the binary operations **A+B** and **A-B** and explain your answers using the related terms like *carry*, *borrow*, *overflow*.
 - b. If **A** and **B** are *unsigned* binary integers, perform the binary operations **A+B** and **A-B** and explain your answers using the related terms like *carry*, *borrow*, *overflow*.
2. Simplify the following logical expressions by using the axioms, properties and theorems of the Boolean Algebra.
 - a. $(\bar{a}\bar{b}c(c + \bar{b}d) + \bar{a}\bar{b})c$
 - b. $\bar{a}bc + a\bar{b}\bar{c} + \bar{a}\bar{b}c + \bar{a}\bar{b}c + abc$