November 13, 2020

Istanbul Technical University

Department of Computer Engineering

BLG 231E - Digital Circuits

Assignment 2

Due Date: Thursday, November 19, 2020, 23:59.

- Please **write and draw neatly**.
- Please prepare your homework using a computer. Points will be taken off for handwritten submissions.
- **Consequences of plagiarism:** Any cheating will be subject to disciplinary action.
- **No late submissions** will be accepted.
- **Submissions:** Submit your solution PDFs to Ninova. Please **write your full name** (first name and last name) **and Student ID** into your solution PDFs.

If you have any questions, please e-mail **Kıymet Kaya (kayak16@itu.edu.tr).**

1. The truth table for a function ***y***(***A***, ***B***, ***C***, ***D***) is given below:

	A	**B**	**C**	**D**	**y**
0	0	0	0	0	**0**
1	0	0	0	1	**1**
2	0	0	1	0	**0**
3	0	0	1	1	**1**
4	0	1	0	0	**0**
5	0	1	0	1	**1**
6	0	1	1	0	**0**
7	0	1	1	1	**0**
8	1	0	0	0	**0**
9	1	0	0	1	**1**
10	1	0	1	0	**1**
11	1	0	1	1	**0**
12	1	1	0	0	**1**
13	1	1	0	1	**0**
14	1	1	1	0	**1**
15	1	1	1	1	**1**

a. Write the expressions of ***y*** in the first and second canonical forms.

b. Minimize the expression in the first canonical form using axioms and theorems of Boolean algebra. Show all steps in your minimization and write the name of the axiom/theorem/property you use on the right-hand side of the expression at each step.

c. Draw the circuit for the minimized expression in (b) using 2-input NAND gates only. Show all steps and explain your work leading up to the final circuit.