November 27, 2020

Istanbul Technical University

Department of Computer Engineering

BLG 231E - Digital Circuits

Assignment 3

Due Date: Thursday, December 03, 2020, 23:59.

- Please **write and draw <u>neatly</u>**.
- <u>Please prepare your homework using a computer. Points will be taken off for handwritten submissions.</u>
- **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 **Büşranur Bülbül (bulbulb17@itu.edu.tr).**

The function $f(a, b, c, d)$ is given below:

$$f(a, b, c, d) = \cup_1 (0, 2, 4, 5, 8, 10, 11, 13, 15) + \cup_\Phi (1, 6)$$

1. Find the set of <u>all</u> prime implicants using the two different methods below:

   a. A Karnaugh map. ***(20 points)***
   b. The Quine-McCluskey method (Sort the minterms into groups according to the number of 1's in each term. Compare pairs of terms in adjacent groups and combine terms where possible. Check off terms which have been combined.). ***(30 points)***

2. Construct the prime implicant chart using the cost criteria given below, then simplify the chart to identify all <u>essential</u> prime implicants. Show and explain each step of the simplification. Write out the expression for the function with the lowest cost, and give the total cost. ***(50 points)***

   Cost criteria: 2 units for each variable and 1 unit for each complement sign.