October 28, 2022

Istanbul Technical University
Department of Computer Engineering

BLG 231E - Digital Circuits
Assignment 3

Due Date: Thursday, November 3, 2022, 23:59.

- 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. **Do not send your solutions by e-mail.** We will only accept files uploaded to the official Ninova e-learning system before the deadline. Do not risk leaving your submission to the last few minutes.
- **Submissions:** Submit your solution PDF to Ninova. Please **write your full name** (first and last name) and Student ID in the box below.

Student ID : **Full Name :**	If you have any questions, please e-mail teaching assistant • **Esin Ece Aydın** (aydinesi16@itu.edu.tr)

1. The incompletely specified logic function $\boldsymbol{f(a,b,c,d)}$ is given below:

$$\boldsymbol{f(a,b,c,d) = \cup_1(0,1,2,3,4,6,13) + \cup_\Phi(5,8,10,14)}$$

a) Find the set of all prime implicants of $\boldsymbol{f(a,b,c,d)}$ in SOP form using a Karnaugh map. (25 points)

b) Find the set of all prime implicants of $\boldsymbol{f(a,b,c,d)}$ in SOP form using the Quine-McCluskey method. (25 points)

2. Using the cost criteria below, construct the prime implicant chart for the prime implicants of $\boldsymbol{f(a,b,c,d)}$ in SOP form that you found above in **Question (1)**. Then, simplify it to obtain the minimal covering sum with the lowest cost. Demonstrate and explain each step of the simplification. Provide the total cost and the expression for the function with the lowest cost. (50 points)

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