Istanbul Technical University

Department of Computer Engineering

BLG 231E Digital Circuits
Take-Home Exam 3

Due Date: Tuesday, November 12, 2019 @ 16:00

- Please be diligent and show all work.
- Prepare your homework on the computer.
- Show complement signs by inserting a dash over the character such as: $\bar{x}$
- **Consequences of plagiarism:** Any cheating will be subject to the university disciplinary proceedings.
- **Submissions:** Please submit your solutions to the Digital Circuits Course Assignment Box. Late submissions will **NOT** be accepted.

$$y = F(x_1, x_2, x_3, x_4) = \cup_1 (0, 1, 2, 4, 7, 10, 13) + \cup_\emptyset (5, 8, 14)$$

1. Use a Karnaugh map to find the set of all prime implicants. **(25 Points)**

2. Simplify the prime implicant chart to find the least cost expression of F. Show the steps of your work. (Note: The cost criteria are 2 units per variable and 1 unit per complement.) **(25 Points)**

3. Write down the expression and its cost. **(10 Points)**

4. Find the set of all prime implicants using the Quine-McCluskey method. Verify that your answer in Question 1 is correct. **(25 Points)**

5. Answer the following questions in 1 or 2 brief sentences: **(15 Points)**
    a. In your own words, explain why drawing rectangles of 4 units is better than drawing rectangles of 2 units on a Karnaugh map.
    b. Explain why we take the "don't care" values as 1 when finding the prime implicants and 0 when simplifying the prime implicant chart.
    c. Give an example of a Karnaugh map where the don't care value(s) is/are not of any use. Explain. (Note: DON'T solve, just draw the map.)