Istanbul Technical University

Department of Computer Engineering

BLG 231E - Digital Circuits

Assignment 4

Due Date: Thursday, December 1, 2022, 23:59.

- <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. **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 to Ninova as a **Logisim .circ file** and **a PDF** that briefly explains how your circuit works. 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
- **Büşranur Bülbül Demir (bulbulb17@itu.edu.tr)**

1. The combinational circuit shown on the right performs arithmetic operations on three 4-bit integers, A, B, and C based on the values of inputs x and y, as explained in the table below. We ignore carry, borrow, and overflow for this circuit.

xy	Operation
00	Z = A + B
01	Z = 2A
10	Z = B - C
11	Z = A - C
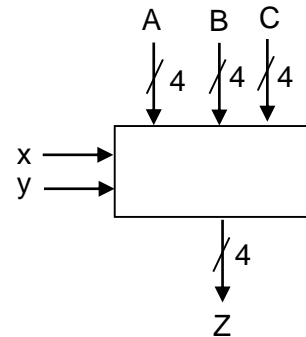
Design this circuit using <u>**only a single parallel adder**</u>, **two 4-bit 2:1 MUXs**, and **NOT gates**. Use **the fewest possible number** of gates and multiplexers to make your circuit design as simple as possible. (**Note:** A 4-bit 2:1 MUX has **two inputs**, each having a **size of 4 bits**.)

Implement and test the circuit using the Logisim tool. Do not show the internal structure of the parallel adder; show it only as a block. <u>Fully label</u> all inputs and outputs. <u>Write your name and student ID</u> at the top of the **.circ** file.

<u>Explain briefly</u> how your circuit works. <u>Create a pdf file</u> for your explanations.