# ISTANBUL TECHNICAL UNIVERSITY

# COMPUTER ENGINEERING DEPARTMENT

## BLG 242E
## DIGITAL CIRCUITS LABORATORY
## HOMEWORK REPORT

**EXPERIMENT NO** : 3
**LAB SESSION** : FRIDAY - 16.30
**GROUP NO** : 18

### GROUP MEMBERS:


150200916 : Denıs Iurıe Davıdoglu
150220770 : Onur Baylam


**SPRING 2023**

# Contents

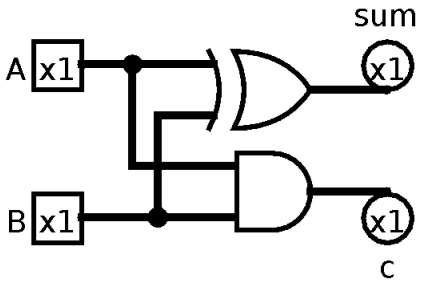
# 1 INTRODUCTION [10 points]

# 2 MATERIALS AND METHODS [40 points]

## 2.1 Preliminary

## 2.2 Experiment

### 2.2.1 Experiment - Part 1



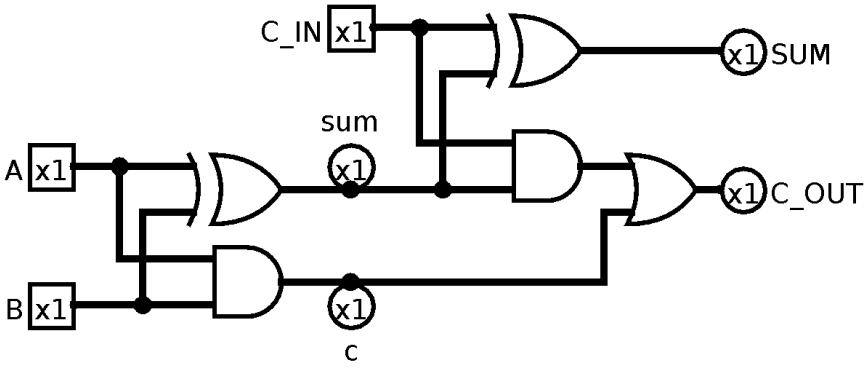

(a) Logisim design

| A | B | SUM | C |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |

(b) Truth table

Figure 1: Half adder design

### 2.2.2 Experiment - Part 2




(a) Logisim design

| A | B | $C_{IN}$ | SUM | $C_{OUT}$ |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 0 |

(b) Truth table

Figure 2: Full adder design as extension of a half adder

### 2.2.3 Experiment - Part 3

| A | B | Carry | Result in Binary | Result in Decimal |
|---|---|---|---|---|
| 0101 | 0111 | | | |
| 1101 | 1001 | | | |
| 1111 | 1111 | | | |
| 0110 | 1101 | | | |

Figure 3: Unsinged A + B computation results

| A | B | Overflow | Result sign | Result in Binary | Result in Decimal |
|---|---|---|---|---|---|
| 0101 | 0111 | | | | |
| 1101 | 1001 | | | | |
| 1111 | 1111 | | | | |
| 0110 | 1101 | | | | |

Figure 4: Signed A + B computation results

| A | B | Borrow | Result in Binary | Result in Decimal |
|---|---|---|---|---|
| 0101 | 0111 | | | |
| 1101 | 1001 | | | |
| 1111 | 1111 | | | |
| 0110 | 1101 | | | |

Figure 5: Unsinged A - B computation results

| A | B | Overflow | Result sign | Result in Binary | Result in Decimal |
|---|---|---|---|---|---|
| 0101 | 0111 | | | | |
| 1101 | 1001 | | | | |
| 1111 | 1111 | | | | |
| 0110 | 1101 | | | | |

Figure 6: Signed A - B computation results

# 3 RESULTS [15 points]

Give the your results what did you get during the experiment. You can also add table, image, etc.

# 4 DISCUSSION [25 points]

Please explain, analyze, and interpret what have you done during the experiment.

# 5 CONCLUSION [10 points]

Comment on any difficulties you have faced, what you have learned etc.