

Date: 18/3/22

Submitted by → (Sec B)
Anushthan Saxena
S0210010027

1 LAB REPORT - 12

Programmable 1-bit ALU

Aim: To design a 1 bit ALU using the given function table.

Software used: Logisim

Provided table:

| F_2 | F_1 | F_0 | ALU function | y_1 | y_0 |
|-------|-------|-------|-------------------|--------|--------------|
| 0 | 0 | 0 | Zero (0) | - | 0 |
| 0 | 0 | 1 | A OR B | - | $A+B$ |
| 0 | 1 | 0 | A AND B | - | $A \cdot B$ |
| 0 | 1 | 1 | A XOR B | - | $A \oplus B$ |
| 1 | 0 | 0 | A PLUS B | Carry | Sum |
| 1 | 0 | 1 | A MINUS B | Borrow | Difference |
| 1 | 1 | 0 | A PLUS B PLUS C | Carry | Sum |
| 1 | 1 | 1 | A MINUS B MINUS C | Borrow | Difference |

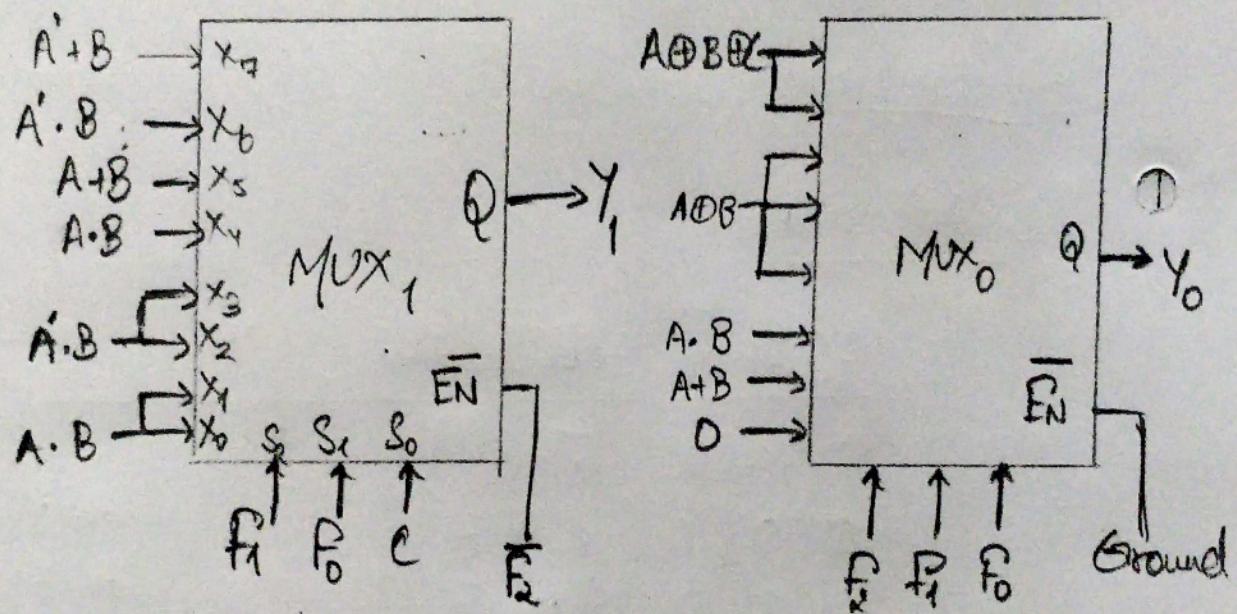
Theory →

→ First 4 functions are logical and generate 1 bit output.

→ Last 4 functions give 2 bit outputs, are arithmetic functions.

2

→ The final ALU output is generated using 2 2-bit MUXs: MUX₀ for y_0 and MUX₁ for y_1 . The required inputs and outputs are mentioned below. MUX₀ is always enabled.



→ The inputs $A \cdot B$, $A' \cdot B$, $A + B$ and $A' + B$ can be generated using 4 2-bit MUX.

