



Khulna University of Engineering & Technology (KUET)

Department of Computer Science and Engineering

Course Code: CSE 4224

Course Title: Digital System Design Laboratory

Lab Report

Name of the experiment: Designing logic unit of ALU in logisim.

Submitted by:

Name: Sajal Basak Partha

Roll no.: 1607101

Year: 4th

Term: 2nd

Date of Submission: 26th April, 2021

Objectives:

The main purposes of this lab are stated below:

→ gathering knowledge about half adder and full adder circuit.

→ gathering knowledge about k-map of full adder & arithmetic circuit.

→ learning about arithmetic and logical operations and implementation of arithmetic circuit.

Introduction:

General purpose ALU has eight arithmetic operations and four logical operations. It has three selector variables S_2, S_1, S_0 which select eight operations with another variable C_i (input carry bit).

For OR and AND operations we use $A_i, B_i, C_i, S_2, S_1, S_0$ as input and generate two consequences or outputs named as F_i & C_{i+1} .

For OR operation:

$S_2 = 1$, input carry C_i is zero in each stage and $S_1, S_0 = 00$; here the function is $F_i = A$. To change the OR operation we must change the input of each full adder circuit from A_i to $A_i + B_i$.

For AND operation:

When $S_2=1, S_1, S_0=10$, it stands for AND operation.

$F = A_i \odot B_i$, we generate AND operation $f_i = A_i B_i$,

some boolean function k_i , f_i is obtained when $S_2, S_1, S_0=110$,

then,

$$F_i = X_i \oplus Y_i = (A_i \oplus K_i) \oplus B_i = A_i B_i + K_i B_i + A_i' K_i' B_i'$$

Experimental Setup:

2-Bit ALU circuit for logical operations are shown below:

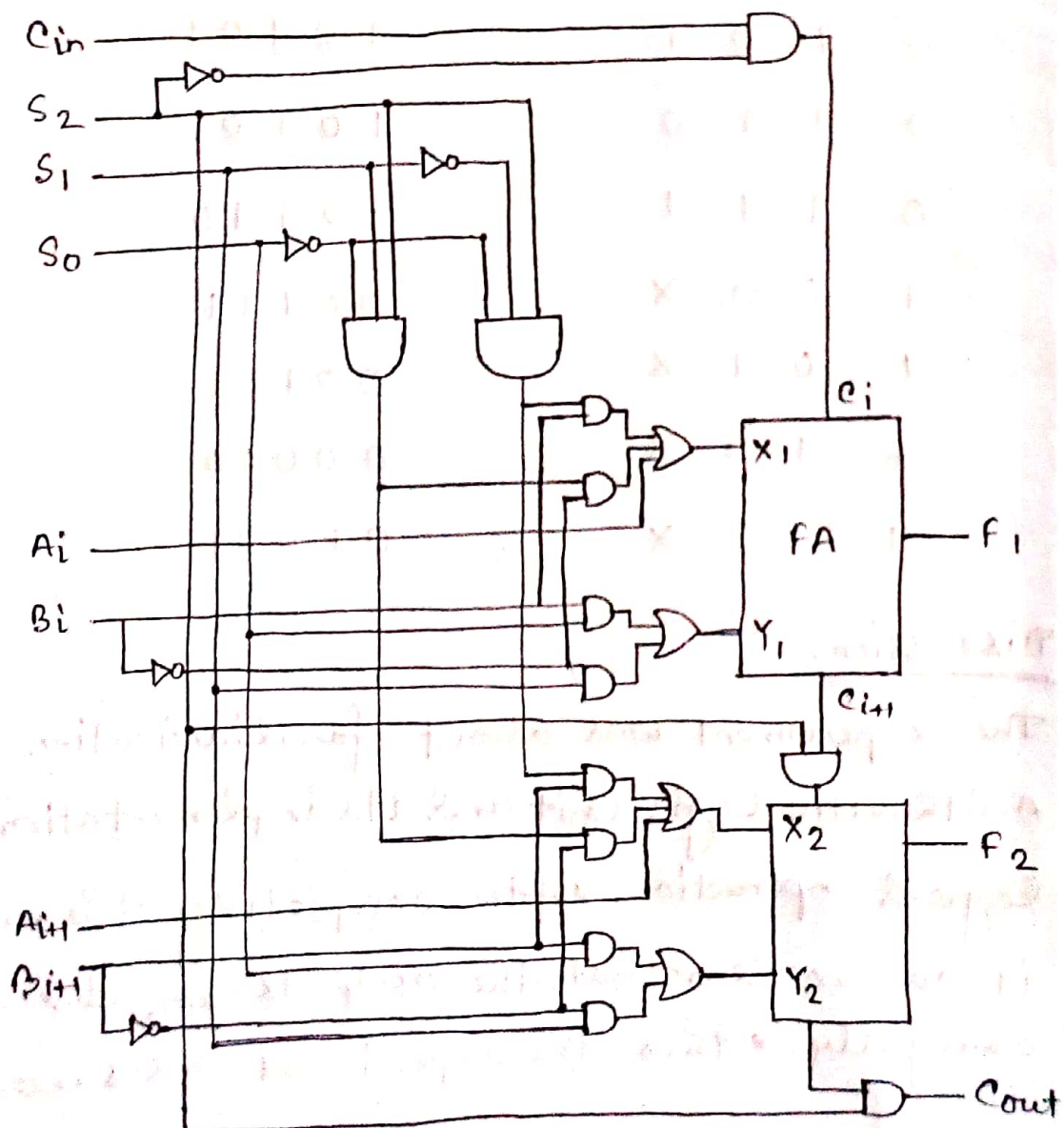


Fig: 1: experimental circuit for 2-bit ALU

Experimental Result:

Here, $A = 0110$ & $B = 0001$

Selection				Output
S_2	S_1	S_0	C_{in}	Count.... 4bit
0	0	0	0	0 0 1 1 0
0	0	0	1	0 0 1 1 1
0	0	1	0	0 0 1 1 1
0	0	1	1	0 1 0 0 0
0	1	0	0	1 0 1 0 0
0	1	0	1	1 0 1 0 1
0	1	1	0	1 0 1 0 1
0	1	1	1	1 0 1 1 0
1	0	0	X	0 0 1 1 1
1	0	1	X	0 0 1 1 1
1	1	0	X	0 0 0 0 0
1	1	1	X	0 1 0 0 1

Discussion:

The experiment was about familiarization with Arithmetic Logic Unit and its implementation for logical operation. After completing the experiment, it can be seen that, the outputs are observed carefully. Thus, the experiment was successful.

Conclusion:

In this lab, the arithmetic and logical operations of ALU were observed. The circuit was implemented from scratch using full adders. The results are observed with the truth table as well.