Course Name: DIGITL LOGIC DES LAB

Course Number and Section: **14:332:233:01**

Experiment:

Lab Instructor: ZAHRA AREF

Date Performed: 11/1/24

Date Submitted: 11/8/24

Submitted by: Chance Reyes 225006531 Vincent Chen 222005704

Course Name: _____

Course Number and Section: **14:332:xxx:xx**

! Important: Please include this page in your report if the submission is a paper submission. For electronic submission (email or Sakai) please omit this page.

----------For Lab Instructor Use ONLY----------

GRADE: _____

COMMENTS:

1.3 Pre-lab Report

Your pre-lab report should contain the following

- Discussion of how you arrived at your design.
- The logic diagram of the circuit implementing the 4-bit arithmetic unit.
- The truth table of the investigated case.
- Your code for the synthesis of the circuit (optional)
- Schematic for the Elaborated Design obtained under the RTL Analysis tab of Vivado (optional)
- The timing diagram obtained from the simulation using Vivado (optional)

2.Experiments

2.1 Experiment A

1. Build the ICOD that you used in Lab1 with 4 switches and 4 LED's. Check that the ICOD on your breadboard is working properly, by toggling each of the input pins from logic '0' (GND) to logic '1' (5V), and from logic '1' (5V) to logic '0' (GND).

2. There are ten input signals. Use two switches of the ICOD unit to have access to the control signals SO and Sl. The other two switches should be connected to X3 and Y3, i.e. the sign bit s of the two operands. Connect the four LEDs to the output bits of the adder, FO to F3. The COUT signal should be checked with the logic probe. **This arrangement will remain the same for all the experiments performed in this lab.**

3. Using the switches set both sign bits to logic '0'.

4. Connect with wires the bits X2, X1 and XO to logic '0' or logic '1' so that X[3:0] represents +2.

5. Similarly, connect Y2, Yl and YO so that Y [3:0] represents +5.

6. Using the 2 switches for control bits S1 and S0, verify that all the operations are being successfully performed and fill the following truth table.

Decimal X Y	Operation	Result		
		Binary	Decimal	COUT
2 5	Addition	0111	7	0
2 5	Subtraction	1101	-3	0
2 5	Increment	0011	3	0
2 5	Decrement	0001	0	1

This result matches what we expected

0010
0101

11
0010
1111
10001
0011

0011

3. Lab 4 Report

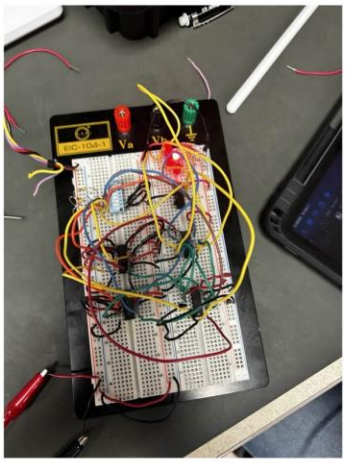
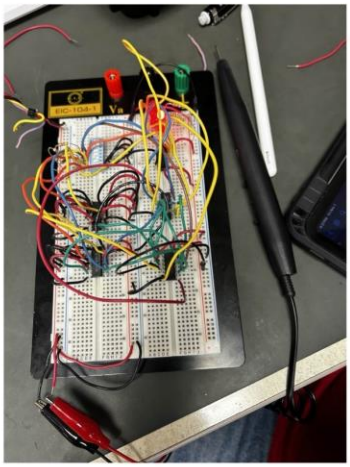
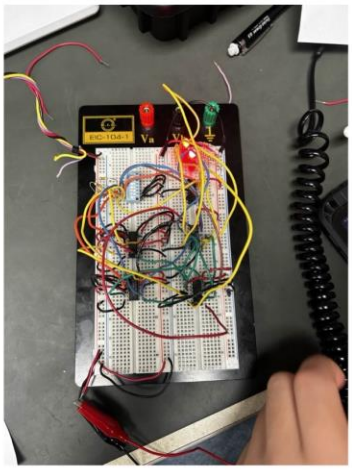
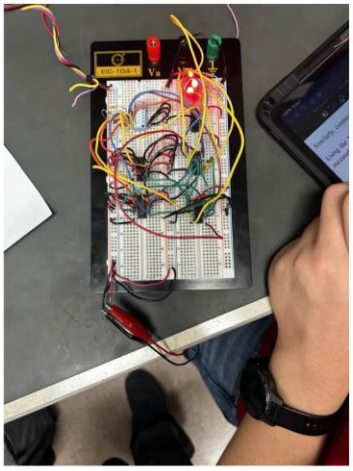
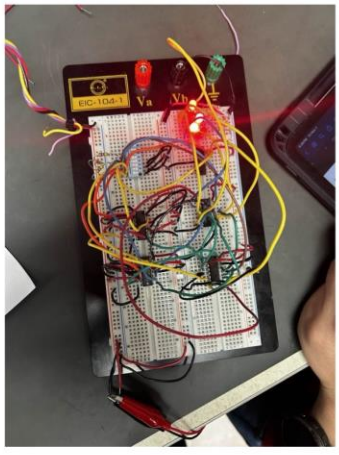
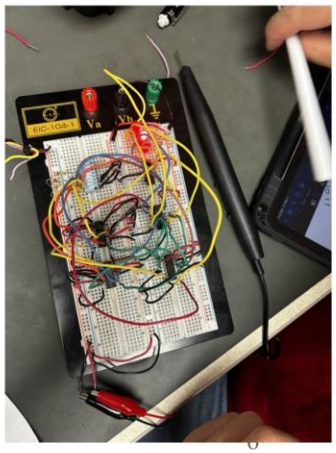
Your report for Lab 3 should include the following:

- Your prelab report with all the materials requested

- Completed tables from Experiments A, B and C with discussion of the results, and discussion of the results obtained in Experiment D

- Images of the circuits that you implemented to realize the ALU

Images:

2.2 Experiment B

1. Change Y3 to logic ' 1' with the switch. What is the number represented now by Y[3:0]?

-3 is now represented by Y[3:0]

2. Using the 2 switches for control bits S1 and S0, verify that all the operations are being successfully performed and fill the following truth table.

1101

Decimal X	Decimal Y	Operation	Result Binary	Result Decimal	Result COUT
2	-3	Addition	1111	-1	0
2	-3	Subtraction	0101	5	0
2	-3	Increment	0011	3	0
2	-3	Decrement	1001	-7	1

This result matches what we expected.

0010
1111
10001

2-13

2.3 Experiment C

1. Change X3 also to logic ' 1' with the switch. What is the number represented now by X[3:0]?

-6 is now represented by X[3:0]

2. Using the 2 switches for control bits S1 and S0, verify that all the operations are being successfully performed and fill the following truth table.

1010
1101
1010

Decimal X	Decimal Y	Operation	Result Binary	Result Decimal	Result COUT
-6	-3	Addition	0111	7	1
-6	-3	Subtraction	1101	-3	0
-6	-3	Increment	1011	-5	0
-6	-3	Decrement	1001	-7	1

This matches what we expected

2.4 Experiment D

1. Set the sign bit X3 to logic '0' and let the sign bit Y3 to be logic ' l'.

2. Change X [3:0] from +2 to +3 by moving the X0 wire from logic '0' to logic '1'. Execute addition and ~~record the result as well as the value of COUT.~~

1101
0011
10000

X	Y	Operation	Binary	Decimal	Cout
3	-3	Addition	0000	0	1
3	-3	Subtraction	0110	6	0
3	-3	Increment	0100	4	0
3	-3	Decrement	0010	2	1

x became 3, y became -3, and Cout was 1 for addition and decrement only

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