CSE/EEE 120

Lab 1 Answer Sheet

Half Adder, Full Adder, 4-bit Incrementer and Adder

Name: Sohum Berdia Instructor/Time: Steve Millman / Tue & Thurs 1:30PM to 2:30PM

Date: 10/02/2022

**Task 1-1: Build and Test the 1-Bit Half-Adder**

Include a picture of your circuit in Digital here:

Diagram

Description automatically generated

Please comment on the single biggest issue you were facing when designing the circuit.

I had trouble initially understanding 1-Bit Half-Adder.

Include a picture of your waveform (timing diagram) here:

Graphical user interface

Description automatically generated

Did the circuit behave as expected? If no, what was wrong?

Yes, the circuit behaved as it was expected to.

Please comment on the single biggest issue you were facing when simulating the circuit.

Forgot steps to open the GTKWaveform but the manual helped me.

**Task 1-2: Build and Test a 4-Bit Increment Circuit**

Include a picture of your circuit in Digital here:

Diagram

Description automatically generated

Please comment on the single biggest issue you were facing when designing the circuit.

Did not know about the Splitter/Merger component and adding half adder circuit in incrementer circuit. But the lab manual was again extremely helpful in solving this issue.

Include a picture of your waveform (timing diagram) here:

Graphical user interface, text

Description automatically generated

Graphical user interface, application

Description automatically generated

Did the circuit behave as expected? If no, what was wrong?

Yes, the circuit behaved as expected.

Please comment on the single biggest issue you were facing when simulating the circuit.

I did not know what all to display in the gtkwaveform simulation. Learning the behavior of the Splitter/Merger was also a pain.

**Task 1-3: Build and Test a 1-bit Full Adder**

Include a picture of your circuit in Digital here:

Diagram

Description automatically generated

Please comment on the single biggest issue you were facing when designing the circuit.

Making the 3-input XOR gate.

Include a picture of your waveform (timing diagram) here:

A screenshot of a computer

Description automatically generated with medium confidence

Did the circuit behave as expected? If no, what was wrong?

Yes, the circuit behaved as expected.

Please comment on the single biggest issue you were facing when simulating the circuit.

None

**Task 1-4: Build and Test a 4-Bit Full Adder**

Include a picture of your circuit in Digital here:

Diagram, schematic

Description automatically generated

Please comment on the single biggest issue you were facing when designing the circuit.

The inputs were not being registered as the bit values were different.

Include a picture of your waveform (timing diagram) here:

Graphical user interface, text

Description automatically generated

Which tests did you perform and why? The following table is an example of how to describe your test sequence. You need to make sure to perform a sufficient number of tests to check the circuit for eventual faults.

| **Test stimulus** | **Test motivation** | **Pass/Fail** |
| --- | --- | --- |
| 0\_0\_0\_0\_0 | Check for stuck-at-1 faults | Pass |
| 0\_1\_1\_1\_0 | Check for cin adding to the sum | Pass |
| 2\_1\_0\_9\_8 | To check for overflow and cout | Pass |
| 1\_5\_1\_D\_7 | Has cout but no overflow | Pass |
| 0\_6\_0\_3\_3 | Check for stuck-at-2 faults | Pass |
| 0\_7\_1\_4\_2 | Check for cin adding to the sum | Pass |
| 0\_4\_0\_2\_2 | Check for stuck-at-1 faults | Pass |
| 0\_6\_0\_3\_3 | To check if sum is produced without overflow | Pass |
| 0\_4\_0\_3\_1 | Check for stuck-at-2 faults | Pass |
| 0\_6\_0\_3\_3 | Check for stuck-at-2 faults | Pass |
| 0\_3\_1\_1\_1 | Check for cin adding to the sum | Pass |
| 0\_B\_0\_6\_5 | To see if a HexaDecimal Output is possible | Pass |
| 0\_5\_0\_A\_B | To check if I can have a decimal output from a hex input | Pass |
| 1\_8\_1\_6\_1 | The closest possible way to get an overflow | Pass |
| 0\_A\_0\_2\_8 | To see if a HexaDecimal Output is possible | Pass |
| 1\_2\_0\_7\_B | Produce cout with a single hex input | Pass |

Please comment on the single biggest issue you were facing when simulating the circuit.

Making the table. I was not sure what to fill in “Test Motivation” column.

**Task 1-5: Create a video and submit your report.**

Record a short video (less than 5 min) showing your schematic in Digital and your waveforms in GTKWave and explain how your design works. Be sure to show yourself in the video and show your screen. **Upload the video to your Google Drive (personal one or ASU one). Copy and paste the sharing link to that video here. Make sure the link is working and pointing to the correct video. Do NOT upload your video to YouTube.** If your circuit is not working as expected, explain in the video how it is not working and where you expect the mistake to be from.

**Video Link:** [**https://asu.zoom.us/rec/share/x2WHChZgUeHnKKi6MoPbSO-010TNENLgk6kkqZRkXfPWg4dg\_mPxkN54gdnAyB2X.50e12C7V7UgD2KSs?startTime=1644556256000**](https://asu.zoom.us/rec/share/x2WHChZgUeHnKKi6MoPbSO-010TNENLgk6kkqZRkXfPWg4dg_mPxkN54gdnAyB2X.50e12C7V7UgD2KSs?startTime=1644556256000)

**At the beginning of your recording, say your name, the task number and circuit name. Be brief in your recording. Submit the completed template to Canvas.**

**Make sure all your files are in the Lab1 directory. Create a zip file of the Lab1 directory. Turn in the zip file and your completed template.**

Lab 1: Lab Report Grade Sheet

|  |  |
| --- | --- |
| **Name:** |  |

**NOTE: You submit the zip file in order to show your work.  
If the zip file is not submitted there is a 5 point deduction!**

## Instructor Assessment

| **Grading Criteria** | **Max Points** | **Points Lost** |
| --- | --- | --- |
| **Description of Assigned Tasks, Work Performed & Outcomes Met** |  |  |
| Task 1-1: Build and Test a 1-Bit Half-Adder | 10 |  |
| Task 1-2: Build and Test a 4-Bit Increment Circuit | 10 |  |
| Task 1-3: Build and Test a 1-Bit Full Adder | 10 |  |
| Task 1-4: Build and Test a 4-Bit Full Adder | 10 |  |
| Task 1-5: Create a video and submit your report. | 10 |  |
|  | **Points Lost** |  |
| Lab Score (50 points total) | **Late Lab** |  |
|  | **Lab Score** |  |