EEE 120

Lab 1 Answer Sheet (Online Class)

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

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Semester/Year/Session (A/B): Summer/2023/C Date:5/27/2023

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

Include a picture of your circuit in Digital here:

A screenshot of a computer

Description automatically generated

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

There were no issues building this circuit.

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

A screenshot of a computer

Description automatically generated

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

The circuit behaved as expected as shown in the diagram above. 1+1 gives sum of 0 and carry of 1 which is correct.

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

There were no issues met when simulating the circuit.

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

Include a picture of your circuit in Digital here:

A screenshot of a computer program

Description automatically generated with medium confidence

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

Dealing with buses were the biggest issue as they were new.

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

A screenshot of a computer

Description automatically generated

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

Yes, it behaved correctly as it showed an overflow when the input was F.

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

There were no issues with simulating the circuit.



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

Include a picture of your circuit in Digital here:

A screenshot of a computer

Description automatically generated

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

Changing the number of inputs for the logic gates was mildly difficult.

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

A screenshot of a computer

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 connected one of the AND gates wrong and ended up having wrong results that I had to fix and debug.

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

Include a picture of your circuit in Digital here:

A screenshot of a computer program

Description automatically generated with medium confidence

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

The biggest issue I dealt with was operating all the splitters/mergers.

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

A screenshot of a computer

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\_2\_0\_1\_1 | Increment inputs to check output range | Pass |
| 0\_3\_1\_1\_1 | Increment inputs to check output range | Pass |
| 0\_4\_0\_2\_2 | Increment inputs to check output range | Pass |
| 0\_5\_1\_2\_2 | Increment inputs to check output range | Pass |
| 0\_6\_0\_3\_3 | Increment inputs to check output range | Pass |
| 0\_7\_1\_3\_3 | Increment inputs to check output range | Pass |
| 2\_8\_1\_3\_4 | Increment inputs to check output range | Pass |
| 2\_9\_1\_4\_4 | Increment inputs to check output range | Pass |
| 2\_A\_0\_5\_5 | Increment inputs to check output range | Pass |
| 2\_B\_1\_5\_5 | Increment inputs to check output range | Pass |
| 2\_C\_0\_6\_6 | Increment inputs to check output range | Pass |
| 2\_D\_0\_6\_7 | Increment inputs to check output range | Pass |
| 2\_E\_0\_7\_7 | Increment inputs to check output range | Pass |
| 0\_F\_0\_7\_8 | Increment inputs to check output range | Pass |
| 3\_1\_1\_8\_8 | Wanted to test overflow and cout. | Pass |

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

The biggest issue was figuring out the hex format for the inputs, sums, cout, and overflow in the stimuli file.

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

[This task is useful to get partial credit if your schematic is not working. Take advantage of it to explain to the grader your understanding of the circuit. More importantly, explain where you think the mistake is in and what you would do if you were given more time to fix it.]

Record a short video showing your schematic in Digital and your waveforms in GTKWave. 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:**

**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 Lab0 directory. Create a zip file of the Lab0 directory. Remember to turn in the zip file and your completed template on Canvas! Make sure you upload the template before the zip file.**

Lab 1: Lab Report Grade Sheet

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

## 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 | 15 |  |
| Task 1-2: Build and Test a 4-Bit Increment Circuit | 20 |  |
| Task 1-3: Build and Test a 1-Bit Full Adder | 15 |  |
| Task 1-4: Build and Test a 4-Bit Full Adder | 20 |  |
| Task 1-5: Create a video and submit your report (Optional) | - |  |
|  | **Points Lost** |  |
| Lab Score (70 points total) | **Late Lab** |  |
|  | **Lab Score** |  |