EEE 120

Lab 1 Answer Sheet

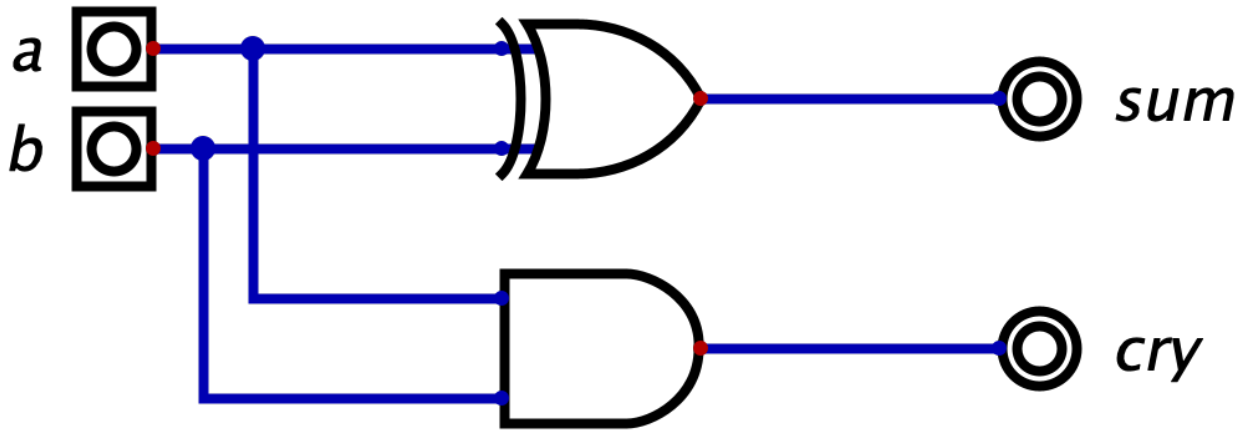
Half Adder, Full Adder, 4-bit Incrementer and Adder

Name: Fauzan Amaan Mohammed Instructor/Time: Josh Hihath (Tus & Thurs 3:00 – 4:15)

Date: Tuesday, 11th February 2024 .

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

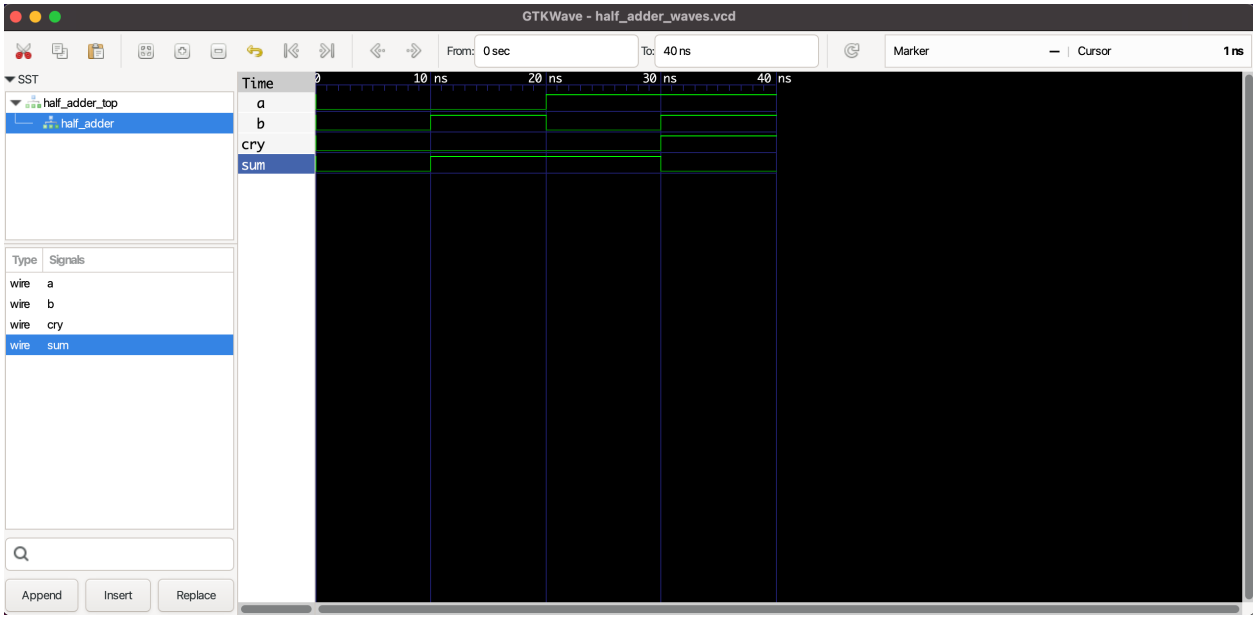
Include a picture of your circuit in Digital here:



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

No Issues

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



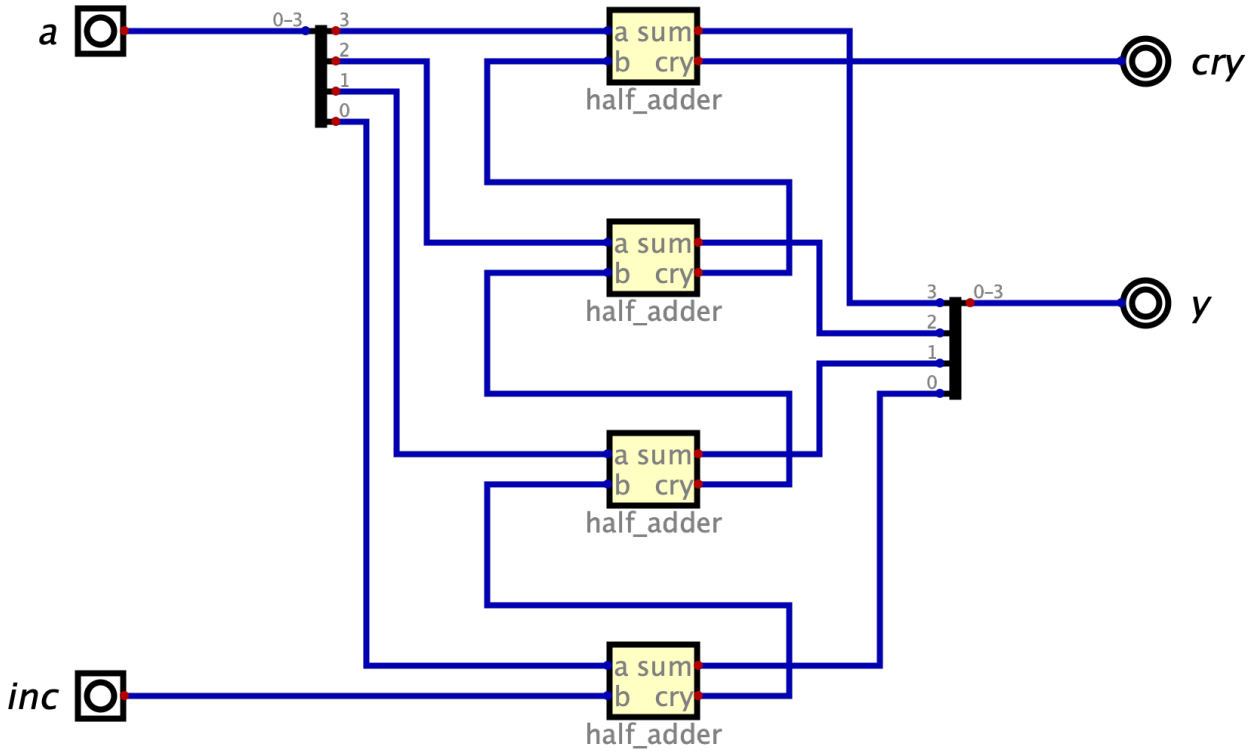
Did the circuit behave as expected? If no, what was wrong?

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

No issues

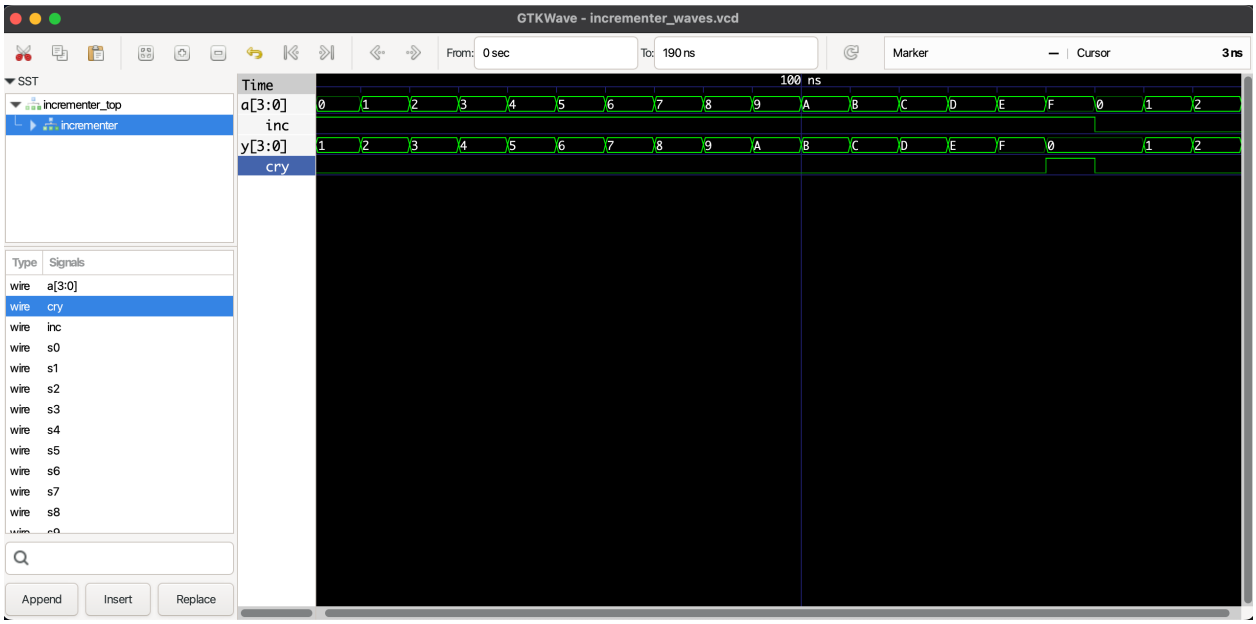
Task 1-2: Build and Test a 4-Bit Increment Circuit

Include a picture of your circuit in Digital here:



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

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



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

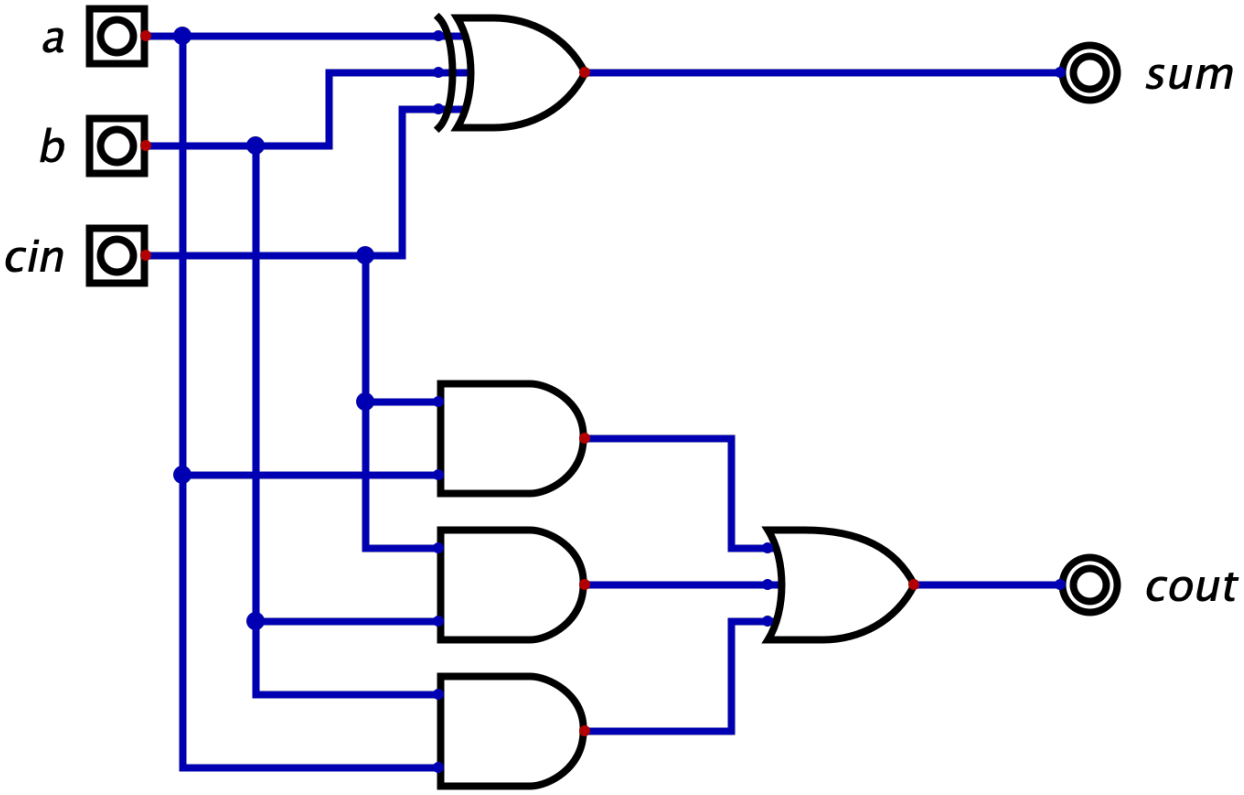
The circuit behave as expected.

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

No issues

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

Include a picture of your circuit in Digital here:



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

Laying out the wires.

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

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

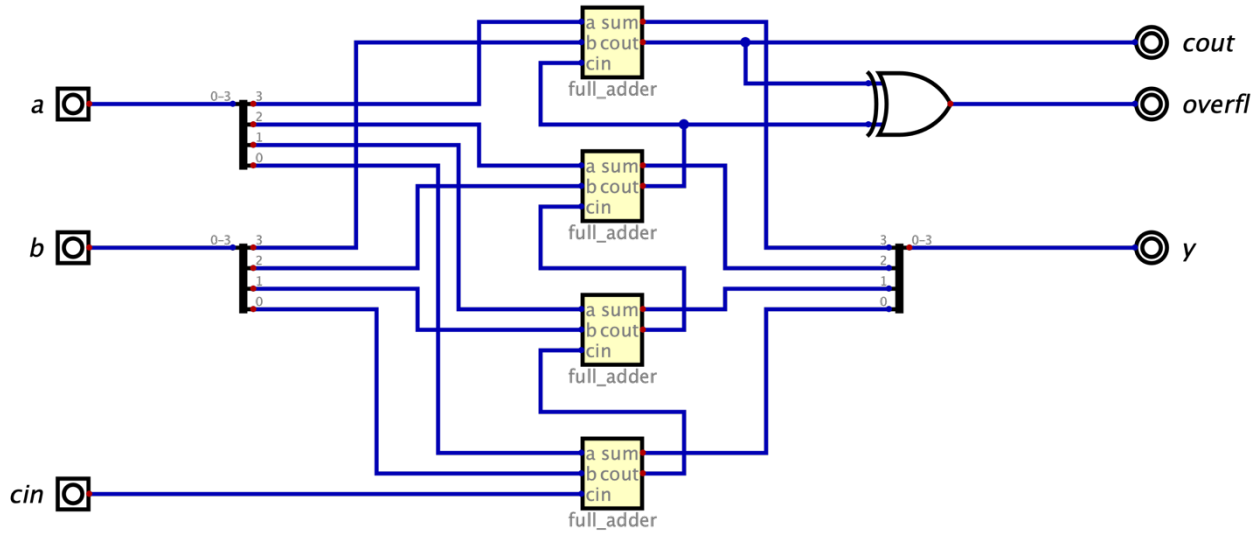
A) The circuit behaved as expected where the sum and carry out works as expected.

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

No issues

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

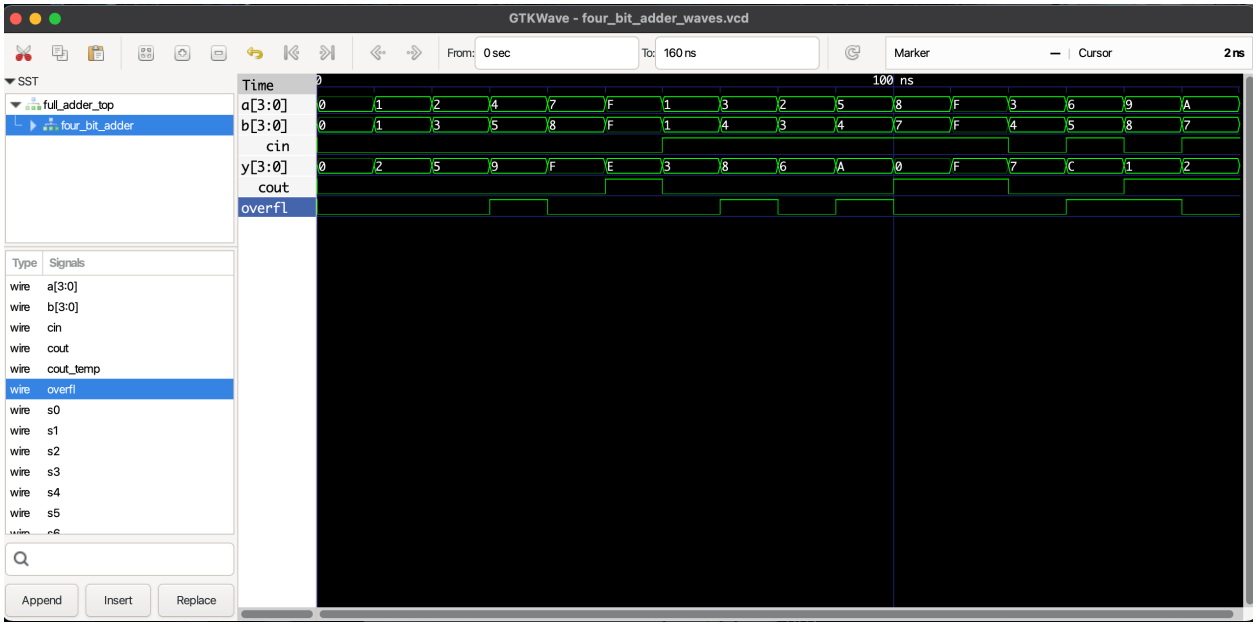
Include a picture of your circuit in Digital here:



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

The multiple wires used and gets confusing where each wire starts and ends.

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



Which tests did you perform and why? Use the following table to describe your test sequence. You need to make sure to perform a sufficient number of tests to check the circuit for eventual faults. Each row of the first column corresponds to a row of stimulus from your four_bit_adder_stim.txt file. Note that you only need to use as many tests as needed. Extra space is provided for enthusiastic students.

Test stimulus	**Test motivation**	**Pass/Fail**
0_0_0_0_0	Check for stuck-at-1 faults (this makes sure none of the wires were accidentally connected to power)	Pass
0_2_0_1_1	Basic addition: 1 + 1 + 0 = 2	Pass
0_5_0_2_3	Basic addition: 2 + 3 + 0 = 5	Pass
0_9_0_4_5	Basic addition: 4 + 5 + 0 = 9	Pass
0_F_0_7_8	Signed overflow test: 7 + 8 = 15 (boundary case for two’s complement)	Pass
1_E_0_F_F	Unsigned overflow test: 15 + 15 = 30 (carry-out should be set)	Pass

Test stimulus	Test motivation	Pass/Fail
0_3_1_1_1	Carry-in test: 1 + 1 + 1 = 3 (ensures carry-in works correctly)	Pass
0_8_1_3_4	Carry-in test: 3 + 4 + 1 = 8	Pass
0_6_1_2_3	Carry-in test: 2 + 3 + 1 = 6	Pass
0_A_1_5_4	Carry-in test: 5 + 4 + 1 = 10	Pass
1_0_1_8_7	Unsigned overflow: 8 + 7 + 1 = 16 (carry-out should be set)	Pass
1_F_1_F_F	Maximum input test: 15 + 15 + 1 = 31 (ensures adder handles max values)	Pass
0_7_0_3_4	Basic addition: 3 + 4 + 0 = 7	Pass
0_C_1_6_5	Carry-in test: 6 + 5 + 1 = 12	Pass
1_1_0_9_8	Unsigned overflow test: 9 + 8 = 17	Pass
1_2_1_A_7	Unsigned overflow test: 10 + 7 + 1 = 18	Pass

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

The terminal showed error in the test cases but the waveform didn't which made me confused on whether my circuit was built incorrectly. I reconfirm by using start simulation and the waveform to test whether the test cases worked.

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

Record a short video showing your schematics in Digital and your waveforms in GTKWave. Be sure to show yourself in the video and show your screen. Explain how your circuit works – you need to convince the grader you did the lab and understand it! **Copy and paste the link to your video below. Make sure the link is working and pointing to the correct video. Remember to include the password if required. Do NOT upload your video to Canvas. It is recommended that you use Zoom to record to the cloud, pasting the link and password below.** If your circuit is not working as expected, explain in the video how it is not working and why you think it is not working.

Video Link:
https://asu.zoom.us/rec/share/JCKfrnUT2vJyiO9F5owCb4PWMGIpUoNAEqCwDKUEW_WZcMa9gVSP190OutVTvHf2.310BegGoJvyJeCVT?startTime=1739418607000

Passcode: KGW?35+G

At the beginning of your recording, say your name and the lab 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. Remember to turn in the zip file and your completed template on Canvas!

Do not include the video in the zip file! This makes the file very large and you run the risk of the zip file not uploading or taking so long to upload that your submission will be late. Remember that the submission is dated at the time the upload completes, not when it starts!

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 you will receive a 0 for this lab!

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	
Lab Score (50 points total)	**Points Lost**	
	Late Lab	
	Lab Score	