

Computer Engineering 315L
Digital System Design Lab
Lab5
ALU

Purpose

Verilog simulation of a 4-bit ALU and testing the 74LS181 IC.

Assignment

Part I

1. Use the Verilog HDL code ALU.v to compile and simulate a 4-bit Arithmetic Logic Unit (ALU). The ALU has four functions: Addition, Subtraction, Bitwise AND and Bitwise OR. You need to simulate all functions of the ALU; you need to write Verilog statements to test all other functions for different inputs. See ‘// Stimulate inputs’ in ALU.v code.
2. Using the output waveform/diagram complete the following ALU function table.

Select Lines		ALU Function
S1	S0	
0	0	
0	1	
1	0	
1	1	

3. Verify the correct operation of the ALU.
4. Apply what you learned in chapter 9 to design your own 4-bit ALU circuit that would operate based on the function table. Note that the ALU circuit doesn't have to be obtained from the ALU HDL code.
5. Compile and run bufif1.v to obtain the simulation diagram. What should the circuit described in bufif1.v be named? Draw the circuit diagram of 'bufif1'.
6. Explain the function of 'bufif1' in the ALU.v

Part II

1. Test the 74LS181 IC using prototyping board and LEDs. Document your results.
2. Can two 74LS181 ICs be connected to form an 8-bit ALU? If you answered yes, provide a circuit diagram. If you answered no, explain why this cannot be done.

Lab Report (checklist and grading)

- Lab reports should be in a narrative form and should be **typed and well organized**.
- **No** hand-written documentation or hand-drawn schematics or diagrams will be accepted.
- Upon completion of the lab, your lab report should include the following:
 - A cover page with your Name, Lab number and title, CPEN315, and Date, all in order and in the center of the cover page (**5 points**).
 - Completed Verilog statements to test the all functions for different inputs (**10 points**).
 - Detailed verification of the correct operation of the ALU using VeriLogger. (**20 points**).
 - Completed ALU function table (**10 points**).
 - Circuit diagram of the 4-bit ALU (**15 points**).
 - bufif1.v simulation diagram and circuit schematics in I.5 (**10 points**)
 - Answer to question in II.2 (**10 points**).
 - Operation demo of the 74LS181 IC (**20 points**).