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Introduction to Logisim

10.1 Revised In-Lab Tasks

1. 2×2 Multiplier Design (2 pts)

Design a 2-bit multiplier in logisim. First you need to set up the truth table of your multiplier by choosing appropriate names for your inputs and outputs. Derive the logical equations for all your outputs. Design the 2-bit multiplier using logic gates. Test your circuit and make it as one complete module. Compare your design to the multiplier provided in Logisim.

2. Register File (3 pts)

Design an 8×32-bit register file. The register file should contain 8 registers: R0 to R7 (each having 32 bits). It should have two read ports to read any two registers and one write port. Model the register file in Logisim. Test the register file for correct operation by reading and writing different register combinations.

3. ALU Design (5 pts)

Design a 32-bit ALU to perform the following eight operations: ADD, SUB, SLT, SLTU, AND, OR, XOR, and NOR. The ALU should have two 32-bit inputs A and B, and a 3-bit input function f. It should have a 32-bit output result, and four flags: output carry, overflow, negative sign, and zero output. Model the ALU in Logisim. Test the ALU for correct operation by providing different inputs and operations.

Bonus: 4×4 Multiplier Design (2 pts)

Design and model a 4×4 multiplier using four 2×2 multipliers and additional adders. Test the 4×4 multiplier using different inputs.