

### Laboratory 3 Addition Circuits

This experiment will allow students to gain familiarity with binary addition circuits.

**PART 1 PRE-LAB:** Read pp. 131-134 and section 11-8 in the Mano textbook. Draw circuit diagrams for the half adder, the full adder and the 4-bit adder using the 7483. The half adder will have inputs X and Y and two outputs SUM and CARRYOUT. The full adder will have inputs X, Y, and CARRYIN with two outputs SUM and CARRYOUT. The 4-bit adder using the 7483 will have inputs A4, A3, A2, A1, B4, B3, B2, B1, and CARRYIN. A4-A1 is one 4-bit operand and B4-B1 is the other. The 4-bit adder will have outputs S4, S3, S2, S1 forming the 4-bit sum and a CARRYOUT.

**PRE-LAB: LAB INSTRUCTOR'S INITIALS:** \_\_\_\_\_

**PART 1 DEMONSTRATION:** Implement your half adder circuit and verify its' correct behavior for all input combinations. Record all inputs and outputs in a table. After your circuit is working correctly, demonstrate it to the lab instructor.

**LAB INSTRUCTOR'S INITIALS:** \_\_\_\_\_

**PART 2 DEMONSTRATION:** Implement your full adder circuit and verify its' correct behavior for all input combinations. Record all inputs and outputs in a table. After your circuit is working correctly, demonstrate it to the lab instructor.

**LAB INSTRUCTOR'S INITIALS:** \_\_\_\_\_

**PART 3 DEMONSTRATION:** Implement your 4-bit adder circuit using the 7483 and verify its' correct behavior. After your circuit is working correctly, demonstrate it to the lab instructor.

**LAB INSTRUCTOR'S INITIALS:** \_\_\_\_\_

**POST-LAB WRITEUP:** In addition to turning your (neatly written) truth tables and data from your experiment and your lab sheet with the instructor's initials, also include the following:

- a) a block diagram showing how two half adders (and possibly another gate or two) can be used to construct a full adder.
- b) a circuit diagram for a full subtractor with input X, Y, BORROWIN and outputs DIFFERENCE and BORROWOUT. The DIFFERENCE output should have the value for X-Y.