

Laboratory 2
CSE 3381
Functionally Complete Sets

This experiment will demonstrate that the NAND and NOR gates are a functionally complete set (along with the constants 0 and 1). Basic sets of logic gates will be constructed using only 2-input NAND gates and 2-input NOR gates.

PART 1 PRE-LAB: Draw circuit diagrams for the following logic gates using only 2-input NANDs. Remember that you may connect the supply voltage directly to an input for a constant-1 or ground for a constant-0.

- a) an inverter (NOT gate)
- b) a 2-input AND
- c) a 2-input OR
- d) a 2-input XOR

PRE-LAB: LAB INSTRUCTOR'S INITIALS: _____

PART 1 DEMONSTRATION: Use a SINGLE 7400 NAND gate chip to connect each of the circuits in your part 1 pre-lab and fill out truth tables to verify correctness. If you have a bug in your design, correct it. Demonstrate your circuit functionality to the lab instructor.

LAB INSTRUCTOR'S INITIALS: _____

PART 2 PRE-LAB: Draw circuit diagrams for the following logic gates using only a 2-input NORs. Remember that you may connect the supply voltage directly to an input for a constant-1 or ground for a constant-0.

- 1) a 3-input AND
- 2) a 3-input OR

PRE-LAB: LAB INSTRUCTOR'S INITIALS: _____

PART 2 DEMONSTRATION: Use no more than two 7402 NOR gate chips to connect each of the circuits in your part 2 pre-lab and fill out truth tables to verify correctness. If you have a bug in your design, correct it. Demonstrate your circuit functionality 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 give the circuit diagrams for all gates in part 1 using only 2-input NOR gates.