Digital Design CSCE 2114

Lab 3 (Part 1 only) Report

Zack Fravel

October 9th, 2015

zpfravel@uark.edu

Abstract

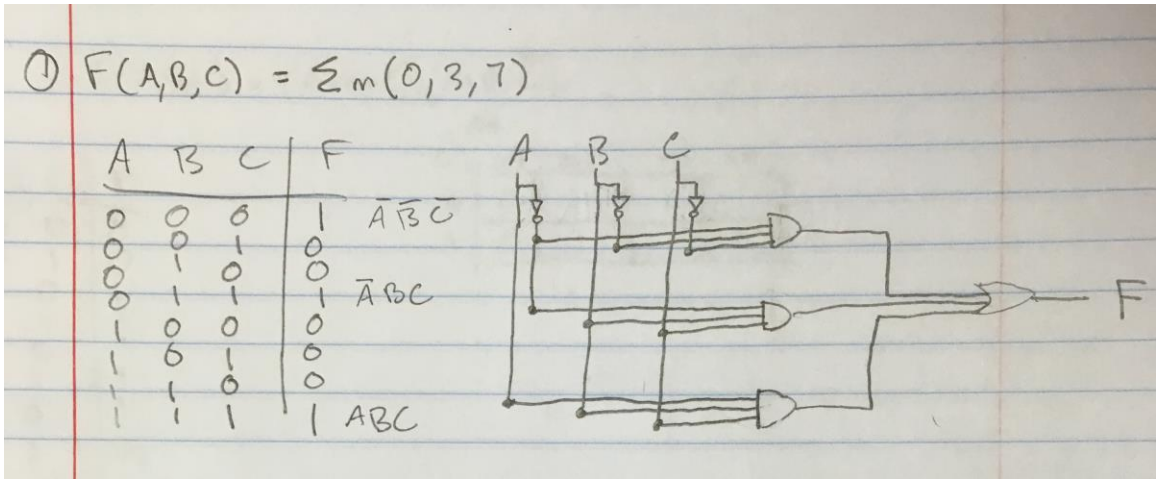
The purpose of this lab was to familiarize more with integrated circuits through construction and documentation. (Note: I was only able to complete part 1 of the lab) Although only part one was completed, two successful circuits were built.

Introduction

The general purpose of this lab was to expand our comfort zone in working with integrated circuit chips and converting logic statements and truth tables into circuits. In the beginning of the lab, we're given a standard logic equation and throughout are asked to recreate the same circuit using different forms of logic gates/IC chips.

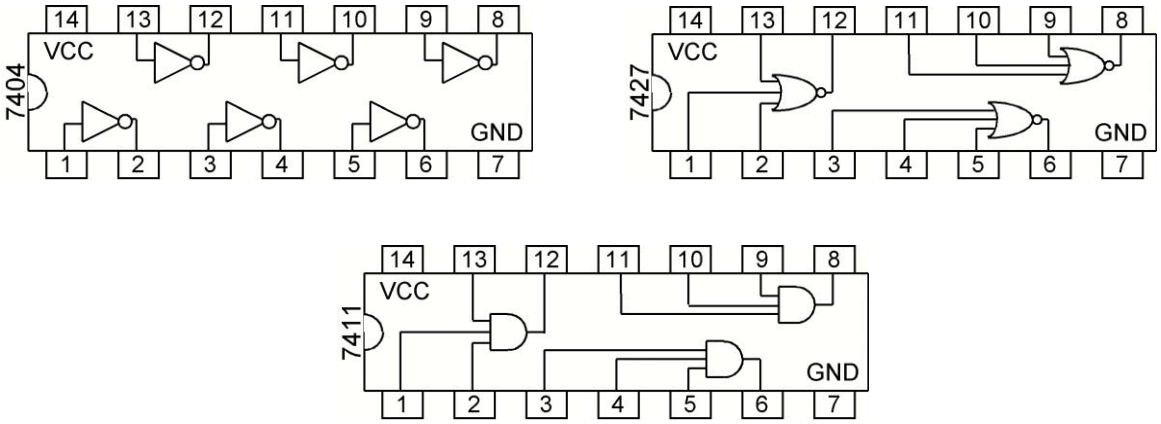
Design and Implementation

The lab begins by giving a standard 3-input function. The function in question is $\boldsymbol{F(A,B,C) = \Sigma m(0,3,7).}$ After drawing out a truth table from the given equation, it's able to be written in standard sum-of-products form, which is $F = \overline{A}\overline{B}\overline{C} + \bar{A}BC + ABC$. Once we have this information, it's relatively simple drawing out the circuit diagram.

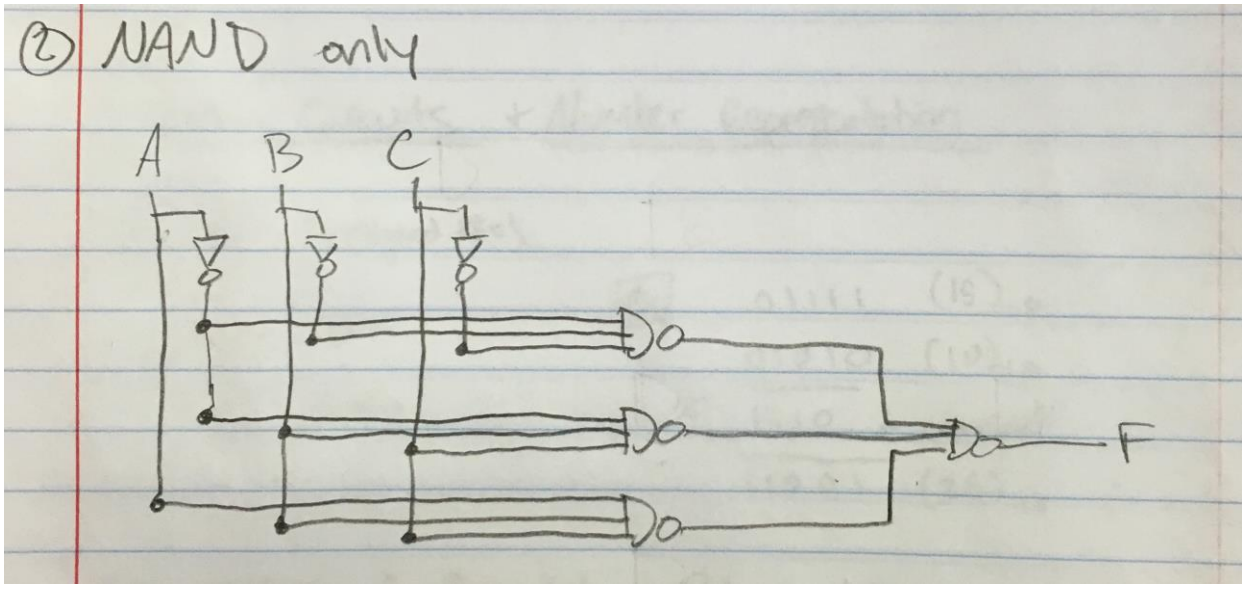


As can be seen, the initial circuit was created using 3 AND gates for all the inputs which feed into a 3-input OR gate, giving the implementation the correct logic. The IC

chips used were the 3-input AND (7411) and the 3-input NOR (7427) as well as an inverter (7404) to change the NOR to an OR.



After completing this circuit, the next step in the lab is to do the same circuit, except this time using only NAND gates. This is actually easier than it sounds, all it requires is replacing all existing AND and OR gates with NAND gates and the inverters with a two-input NAND gate.



Results

Both circuits, once the logic was figured out, were relatively trivial to put together after working around the initial construct. When I was initially building the first circuit I was having a hard time figuring out it was possible because I couldn't find a regular 3-input OR gate IC chip. It took a minute to realize you can create your own by combining an inverter with a NOR gate. The second circuit functioned as intended upon changing all the gates to NOR gates.

Conclusion

The original purpose of this lab was to get more familiarized with implementation of logic statements and functions using actual circuits. Both circuits created were different in implementation, but functionally identical.