

IE1204 Digital Design - Lab Report

Module 1

Goal
Procedure
Showcase

Module 2

Goal
Procedure
Showcase

Module 3

Goal
Procedure
Showcase

Module 4

Goal
Procedure
Showcase

Module 1

Goal

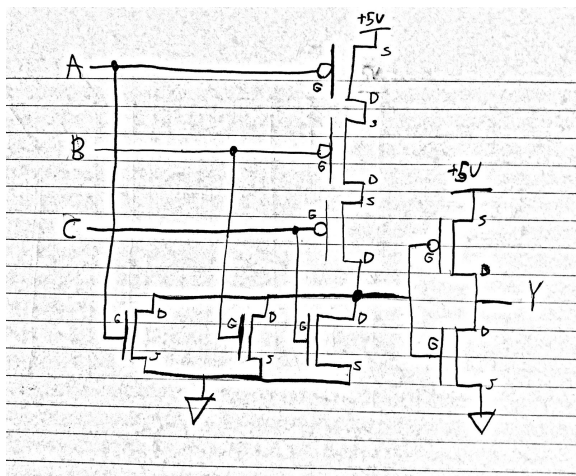
To build an OR gate out of transistors, jumper wires, and a power source.

Procedure

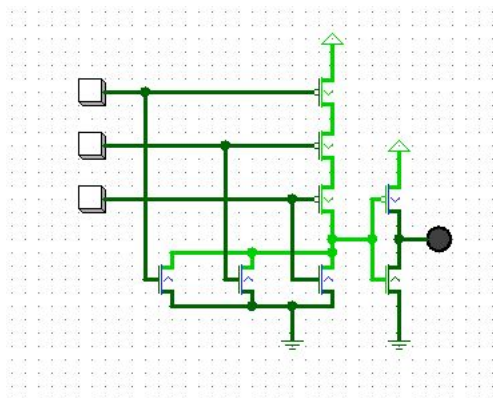
The goal was achieved by placing three P-MOS transistors in series connected to a transistor-made NOT gate, as well as three N-MOS transistors in parallel, connected to the same transistor-made NOT gate.

Showcase

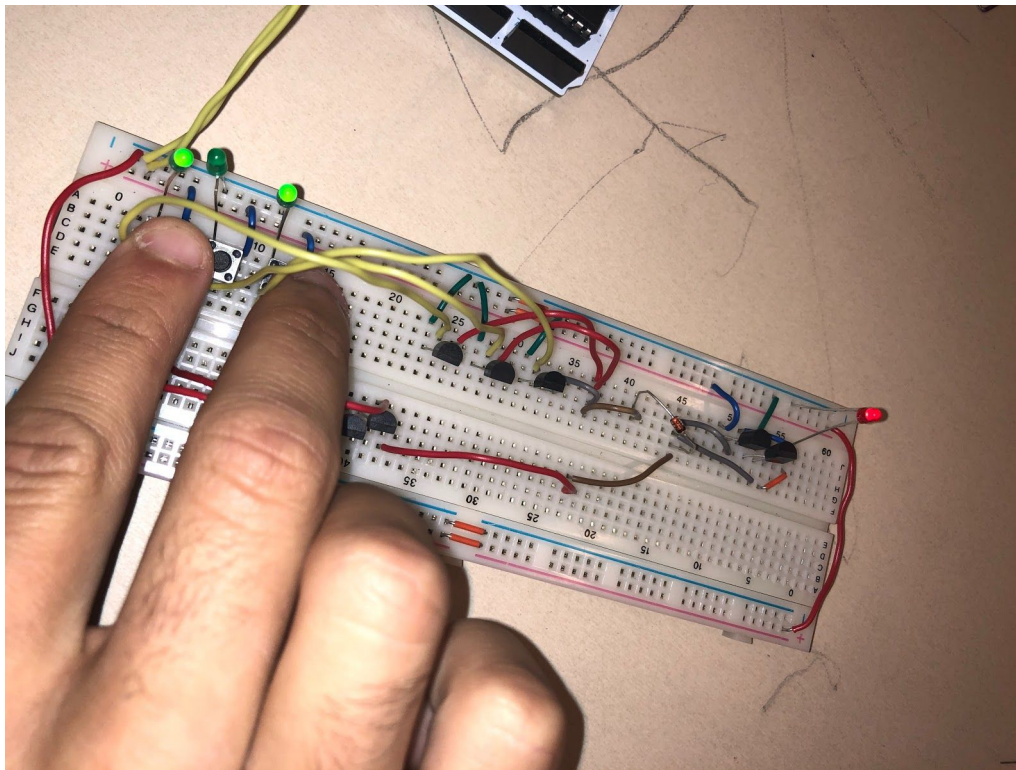
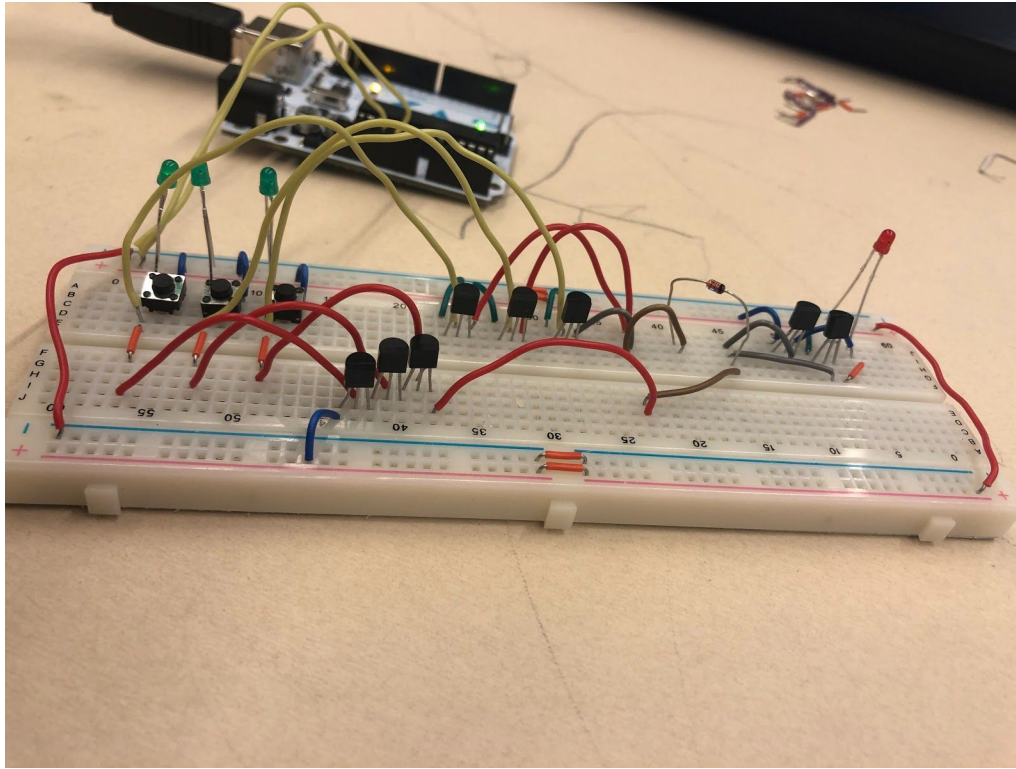
Diagram of Module:



Logisim Simulation of Module:



Actual Module:



Module 2

Goal

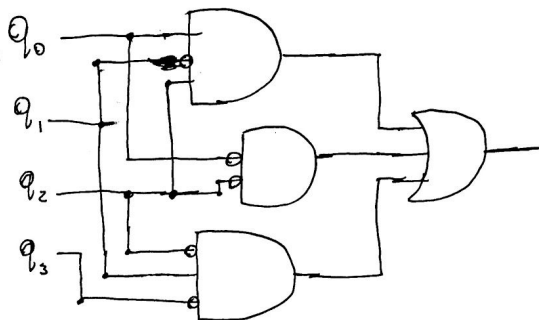
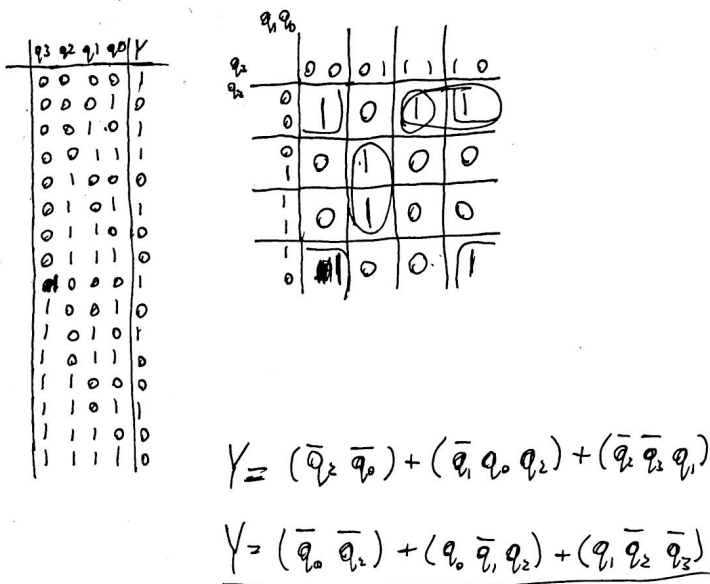
The goal of this module was to design an arbitrary truth table based on the digits of my birthday, and to design a circuit for it.

Procedure

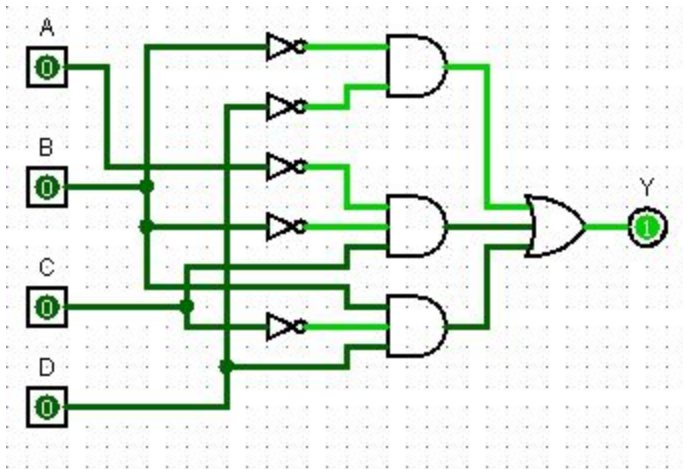
By writing a truth table with the digits of my birthday as the outputs, I was able to put this truth table into a K-Map. From the K-Map, I was able to write a simplified boolean algebraic equation, which I then designed in my breadboard.

Showcase

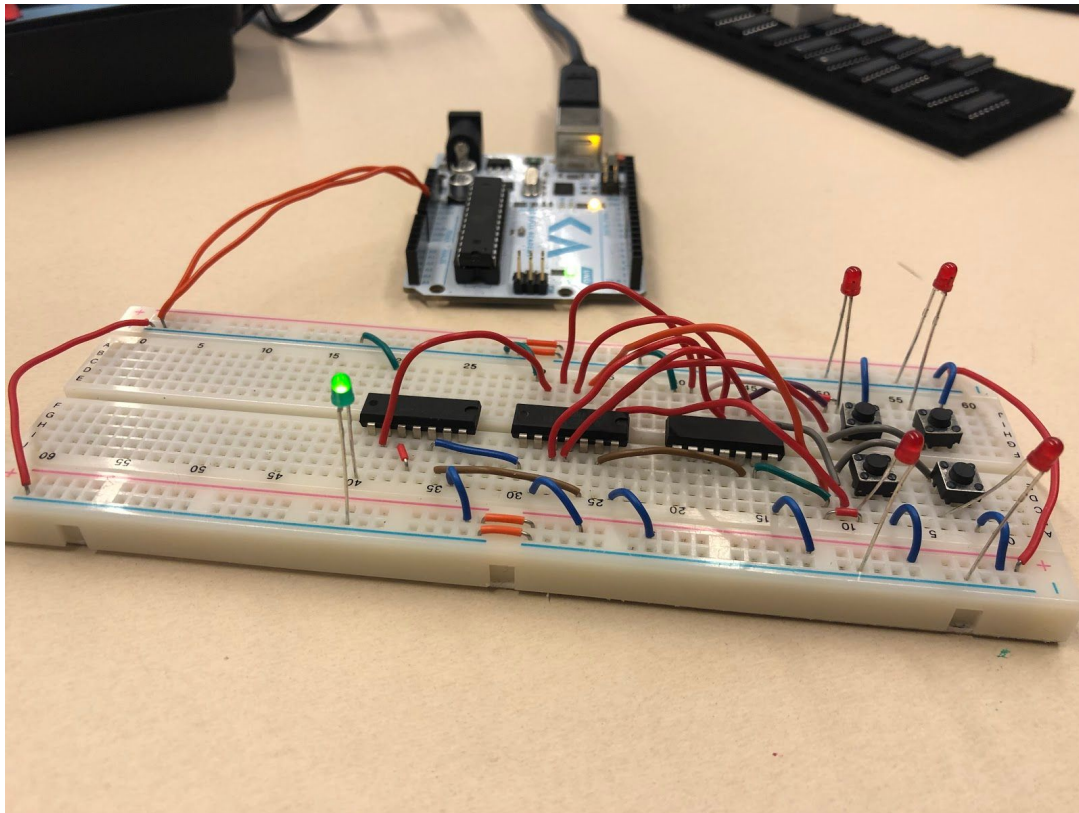
Diagram of the Module:



Logisim Simulation of Module:



Actual Module:



Module 3

Goal

The goal of this module was, given an FSM model, to build the very same FSM in my breadboard.

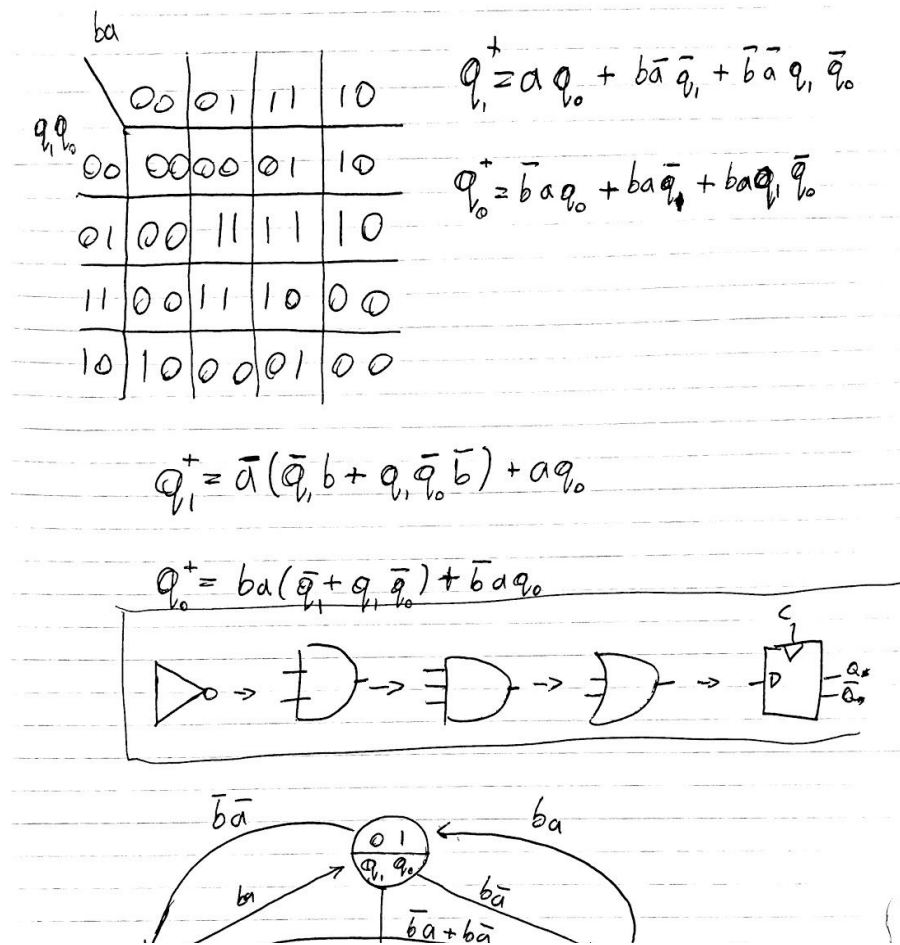
Procedure

This module's goal was achieved by initially finding the truth table for this FSM, separating it into the truth tables of the two distinct outputs, and finally by using K-Maps to, similarly to module 2, design a combinational logic circuit for this FSM. A D-Flip Flop was used as a state register, so as to keep the circuit synchronous.

While many classmates chose to use MUXes, as the crazy person that I am, I decided to build the circuit out of logic gates only. It became *messy* to say the least, but worked!

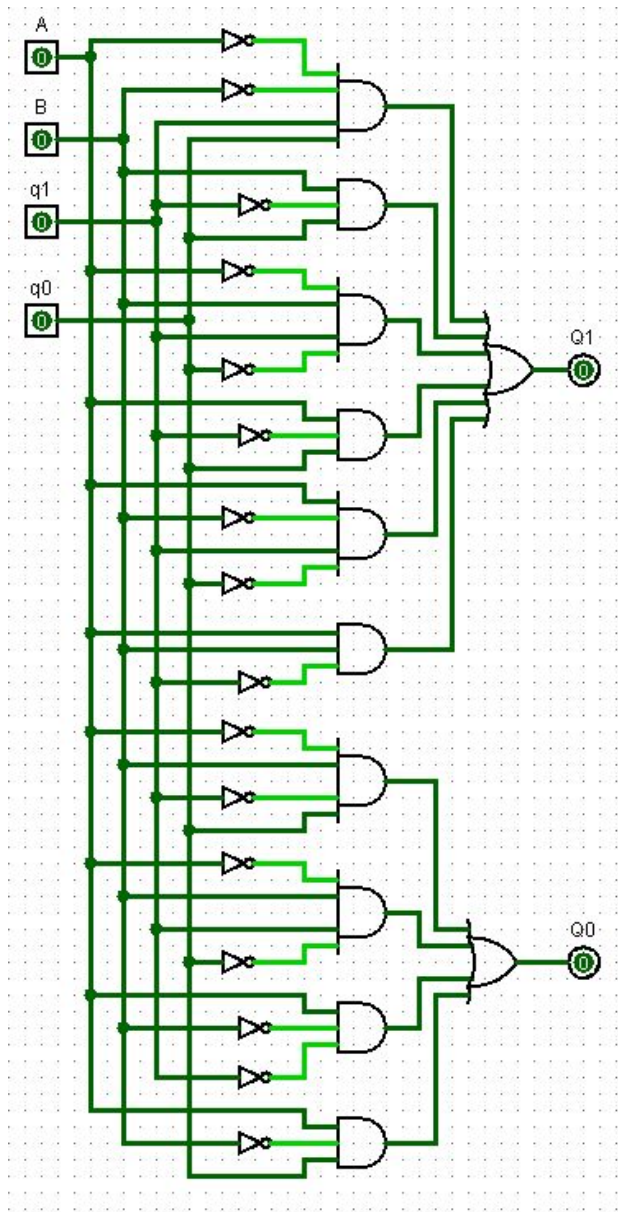
Showcase

Module Diagram (truth table, k-maps, boolean equations):

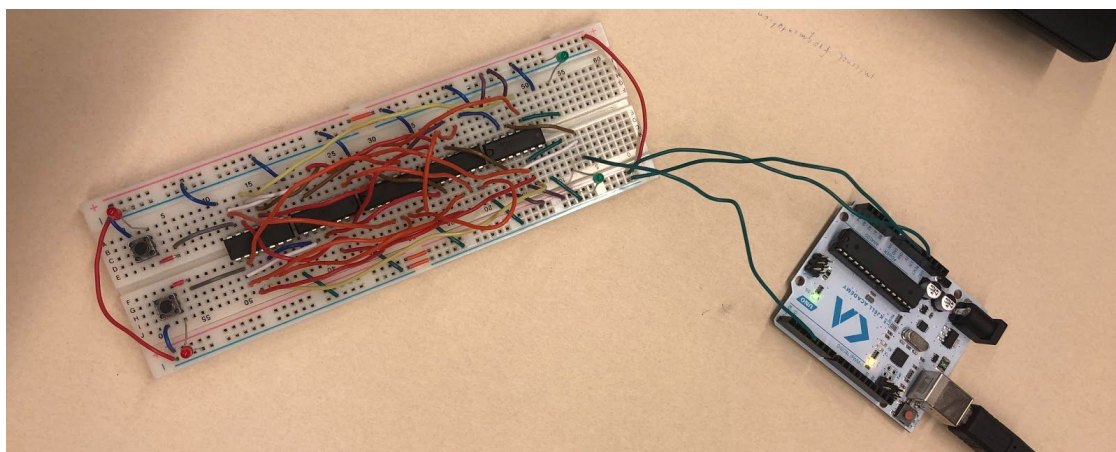


		ba						ba			
q, q_0		00	01	11	10	q, q_0		00	01	11	10
00		0	0	0	1	00		0	0	1	0
01		0	1	1	1	01		0	1	1	0
11		0	1	1	0	11		0	1	0	0
10		1	0	0	0	10		0	0	1	0
q_1^+						q_0^+					

Logisim Simulation:



Actual Module:



Module 4

Goal

The goal of this module was to, using diode ROM, cycle through the digits of my birthday using the 7-segment LED display provided in the lab kit.

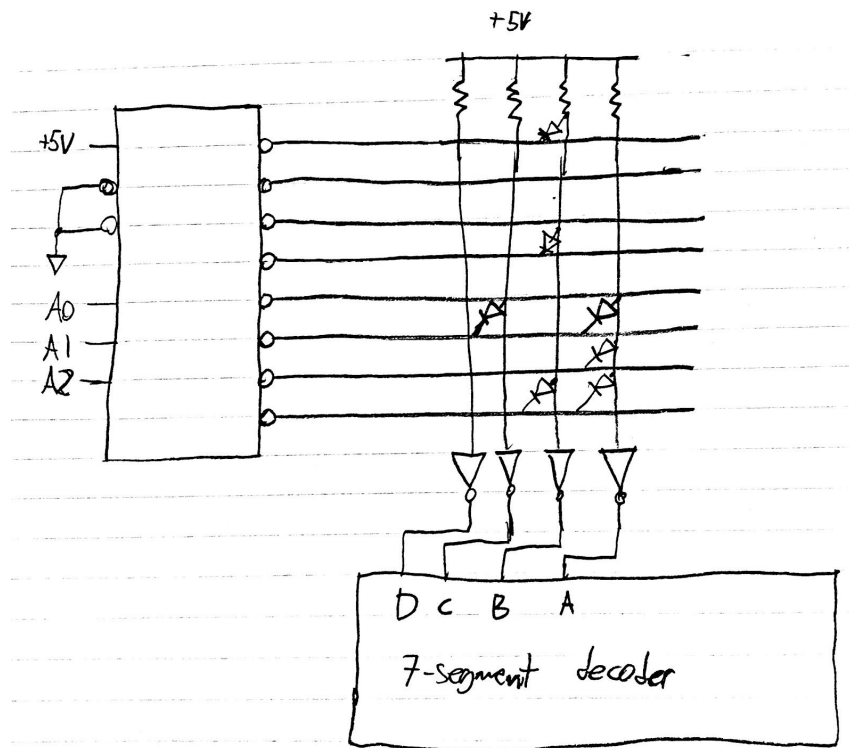
Procedure

In order to reach this goal, I had to use a 3-bit binary decoder along with the Arduino clock, to cycle through 8 distinct states (as shown by which LED is turned off below). Then, using resistors and diodes as a sort of “AND” gate, I will hard-wire a memory based on 4-bits that will be fed into the 7-segment display decoder, in order to display each digit of my birthday, one at a time.

Since my birthday is May 13th, 2002, the expected digits are 2-0-0-2-0-5-1-3.

Showcase

ROM Memory Diagram:



Actual Module:

