Lab 1 - 2/7/22

AND & OR Gates

EGT 245 - Digital Electronics

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Introduction

The purposes of this experiment are as follows: allow students to build a physical circuit using multiple different components, build familiarity with lab equipment and the mentioned components, and utilize the learned formulae to compute theoretical circuit values, then test those values against real-world models.

Required Equipment & Components

- 74HC08 (4 Channel AND Gate IC)
- 74HC32 (4 Channel OR Gate IC)
- Breadboard with Jumper Wires
- SPST Switch (x2)
- 5V Power Supply

Theory

Each utilized IC contains four, independent, dual input, gates. The 74HC08 contains AND gates and the 74HC32 contains OR gates. Each channel has two inputs. In the case of the HC08, **both inputs must be high to create a high output** ($A * B = C$). For the HC32, **either input can be high to create a high output** ($A + B = C$). In this demonstration, a single gate from each IC would be connected to two switches, one per input. The switches were toggled based on the sequences found in the truth tables below. The output LED was illuminated if the correct logic was applied.

Component Layout

74HC08
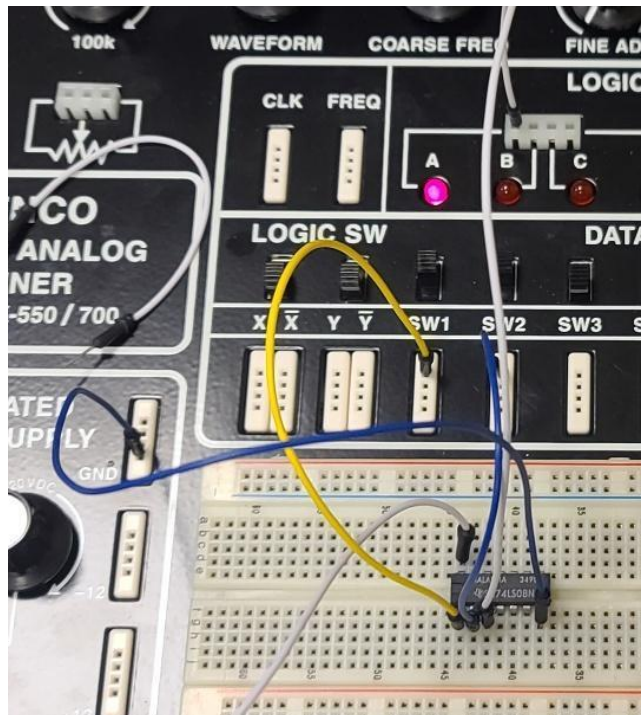
74HC32
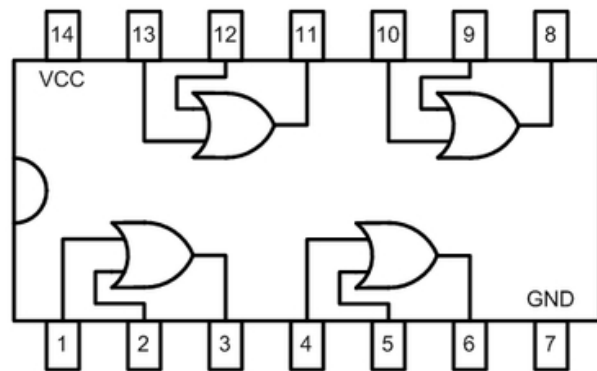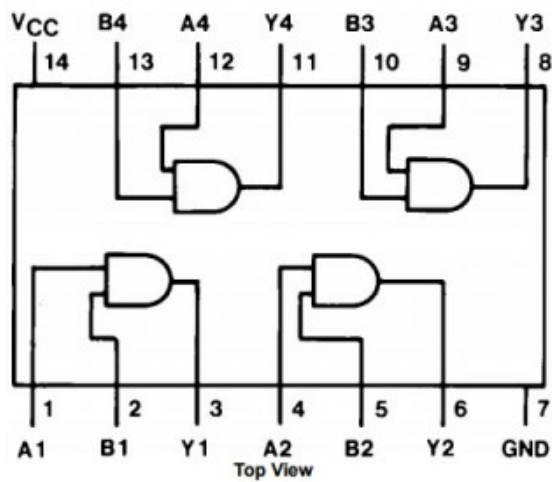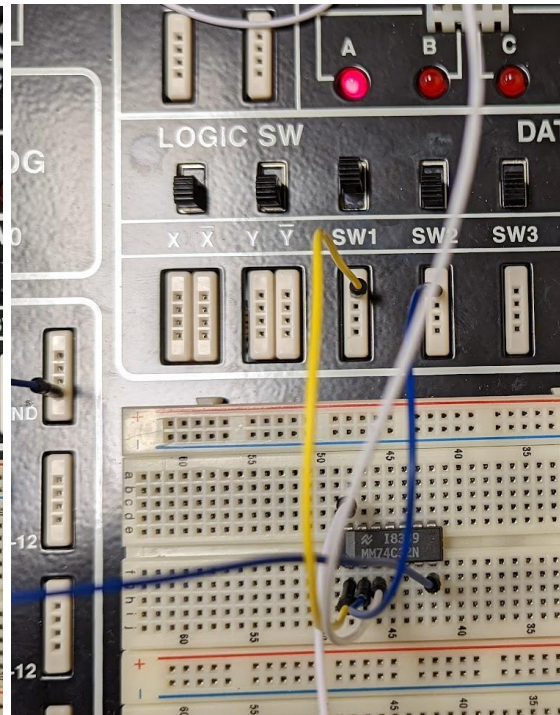
Experimental Results

74HC08 AND Gate		
Switch S1	**Switch S2**	**Output (LED)**
0	0	0
0	1	0
1	0	0
1	1	1

74HC32 OR Gate		
Switch S1	**Switch S2**	**Output (LED)**
0	0	0
0	1	1
1	0	1
1	1	1

Conclusion

Through the use of AND and OR gate Integrated Circuit (IC) chips, we were able to learn more about their applications. These applications would be seen in the form of logic gate-based LED circuits. Once the current passed through the logic gates and returned their value the LED would light up depending on that said output. The AND gates were straightforward when applying since the current had to be going through both inputs for the gate to output true and light up the LED. These inputs were applied through switches which either sent the current through the circuit or not. The OR gates were also straightforward since if either of the switches sent through the current in the circuit the gate would return true and light up the LED. Overall, we believe that this lab was a great way to introduce logic-based circuits using IC chips.