Lab01- K-Map Simplification for an LED-based Circuit

In this lab, we built a more complex circuit than the sum bit of a full adder where we use simplification techniques to make the circuit more useful using fewer things. There are several components of this lab:

LED Control Circuits

In this part of the lab, we filled out the truth table for three inputs A, B, and C. Based on the bit representation, we filled in 0 or 1 values for 0 to 5 input. We put an X where the input value was 6 or 7. From this truth table, we got our boolean expressions for all three LEDs as shown below:
LED 1 = A'B'C + A'BC' + A'BC + AB'C' + AB'C
LED 2 = A'BC + AB'C' + AB'C
LED 3 = AB'C' + AB'C
Going further with the lab, to simplify the truth table and the boolean expressions, we form K-maps for each output. Finishing the K-maps, I came up with more simple boolean expressions for my outputs:
LED 1 = A + B + C
LED 2 = A + BC
LED 3 = A

Breadboard Setup

I used A, B, and C to refer to my 3 inputs and LED1, LED2, and LED3 for my outputs. I pick 3 5 pin rows on the breadboard and connect them to switches 1, 2, and 3 (which are my A, B, and C respectfully). I wired my A, B, and C to Logic Indicators 1, 2, and 3 accordingly. The Logic Indicators help us to visualize the inputs.
I pick another 3 rows and connect them to Logic Indicators 6, 7, and 8. Further, I connected LED1, LED2, and LED3 respectfully to the Logic Indicators 6, 7, and 8. With each LED, resistors were also connected and were grounded.

Circuit Realization

Further making this circuit IC 7432 (OR) and IC 7408 (AND) were used. I wired A and B into one OR gate and then the output from that went into another OR gate with C and the output from that was connected to LED1. then, B and C we the two inputs to my AND gate. The output from my AND gate was then inputted to an OR gate. A was the other input to that OR gate and the output from the gate was connected to LED2. LED3 was directly connected to A.
Thus this circuit displayed the three boolean expressions for LED1, LED2, and LED3. The video showing my circuit is attached.

Analog Input to Binary Encoding & Arduino Sketch

For this experiment, I used the analog input of the potentiometer, use the Arduino to convert that input into binary values in 3 bits, and then connected it to my circuit to control 3 LED's to see how they light up based on how high the potentiometer is turned.
I connected the outer left column of the '10K POT' to GND and outer right column to +5V. I wired one of the middle columns to Analog In pin 0 in the Arduino. I the wired Arduino pin 11, 12, and 13 to A, B, and C respectively and wired the Arduino to GND and +5V too. I typed in the sketch. What I observed was that the three LED's lit up respectively to their bits from 0 to 5 which happened when I turned the knob on the potentiometer. The circuit was implementing the boolean expressions using analog input.
The video showing the circuit is attached.

Overall, the lab showed us how to make a boolean expression into a circuit and the power of K-Maps. It also introduced to a new piece of equipment, a potentiometer, and its usage.