Laboratory Report 7 Digital Systems

Module	EE4522. Digital Systems 1
Date	12/04/2023
Lab Number	7
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Introduction:

This lab focuses on creating a digital counter-decoder circuit. This circuit will display the letter O on the seven-segment display in a certain order and frequency. The frequency will be changeable with a button up to 25Hz which the human eye no longer be able to detect when the LEDs are being turned on and off. Lastly, using the oscilloscope we can measure and test the circuit.

Procedure:

To construct the following circuit, these parts will be required:

- Breadboard
- Wires
- 7-segment display
- 74HC193 chip
- 74HC138 chip
- 330Ω resistors

Using the schematic and the wiring diagram it was possible to construct the circuit which should look like figure 1 when finished.

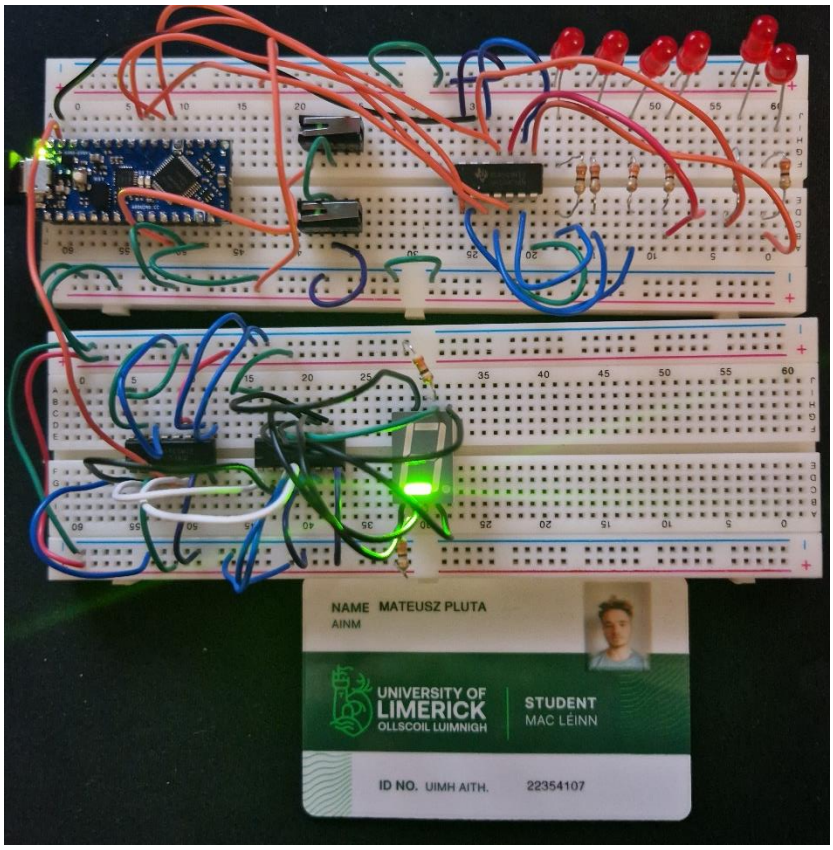


Figure 1 Photo of the circuit.

Results:

Challenge 7.1

If Tstate is 1/flck and flck is 100Hz then:

$$Tstate = 1/100\ Hz = 0.01s$$

Therefore every 0.01s it will change state.

Challenge 7.2

To improve the system so that there is no delay when one circle is complete you needed to remove the LOAD wire.

Challenge 7.3

The frequency of which the lights light up is about 12.5hz.

Challenge 7.4

To get the 7-segment display to show the letter U, you must connect U3a input to 5VDDV0. Removing the wire will also work but is not allowed for this laboratory.

Challenge 7.5

To change the direction in which the LED's move you must disconnect the Load and put it to BO, then you put GND from DOWN to UP and finally the UP WIRE into the DOWN pin.

Challenge 7.6

The reason for that is because in Lab4 the 7-segment display, displayed multiple segments at once meanwhile Lab7 displayed only one at a time.

Challenge 7.7

Using ohm's law, the total current flowing through each LED is 3.8mA.

5V/165 Ω = 30mA // 30mA/8 = 3.8mA.

Challenge 7.8

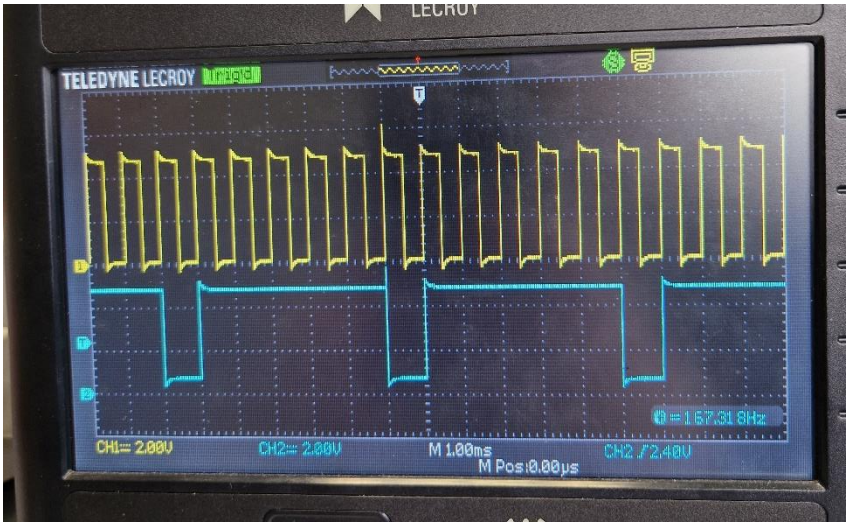


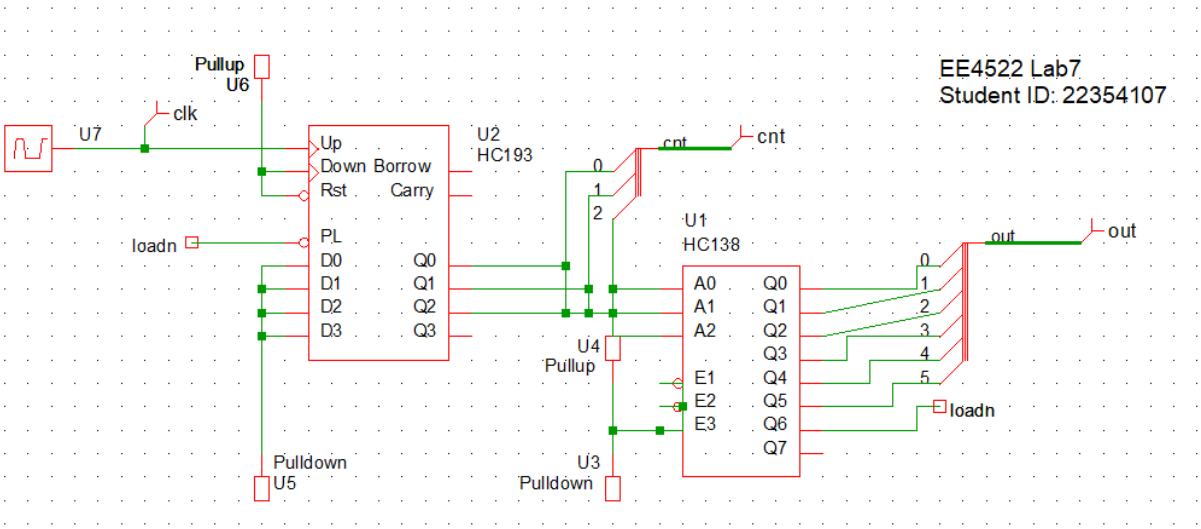
Figure 2 Photo 1 of the scope

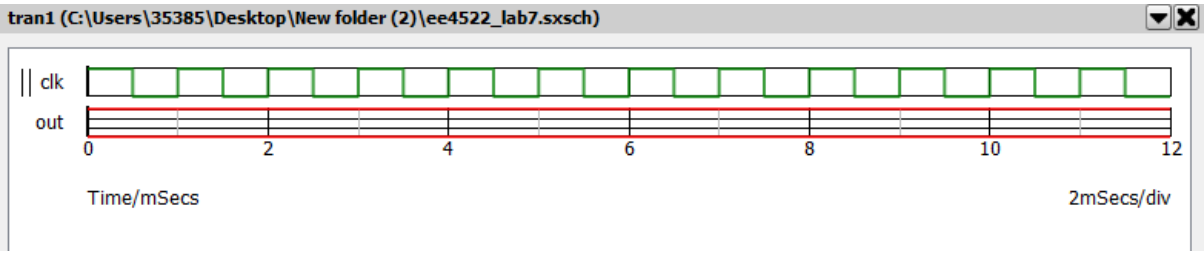
Challenge 7.9

This is the a picture of the scope of what happens at the decoder output Y[6]. Using time base setting and trigger features to zoom right into the event.

Figure 3 Photo 2 of the scope

Challenge 7.10





Conclusion:

In conclusion I was able to build the digital counter-decoder circuit without much trouble, I was able to make the 7-segment display, display the letters O and U in a circular motion as well as making it go the other direction. Then using the oscilloscope, I was able to measure the results as well as complete the simulation on Simetrix.

Declaration of authorship: "I confirm that this lab report, submitted for assessment, is my own original work".