Hardware Assignment Report

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EE22BTECH11202

Components

1. Breadboard
2. Seven Segment Display - Common Anode
3. 7447 Seven Segment Display Decoder
4. 7474 D FlipFlop x2
5. 7486 XOR gate
6. 555 precision timer
7. Resistor 10MΩ
8. Resistor 1KΩ
9. Capacitor 47nF
10. Capacitor 470nF
11. USB micro B breakout board
12. Jumper wires

1 Setup

- This circuit uses 5V from microusb.
- This acts as the Vcc of the circuit.
- The inner buses on both sides are at Vcc.
- The lowest bus is GND.
- The uppermost bus is carrying the Clock signal from the 555 timer.

2 Circuit Overview

1. The Flipflops take clock from the clock bus and based on their initial state, output a sequence of numbers.
2. The sequence is fixed and if the circuit is operated without concern for the initial state, the output number shown is generated randomly from 1 to 15 (both inclusive), with equal probability of all of them.

3. The decoder is able to show numbers from 0 to 15, and the ABCD formed by the flipflops do not become 0000 at any point of time.

4. The output repeats after all 16 numbers are shown.

5. This circuit is deterministic, hence, the randomness can be decoded out by simply refering to the sequence.

6. Sequence generated by this sequence is 3,7,15,14,13,10,5,11,6,12,9,2,4,8,1,3,7.....

Timer

1. The time period can be changed using different values of Resistor and Capacitor.

2. As the capacitor advised (10nF and 100nF or 100nF and 100nF) were not of good quality, the capacitor used in their place are 47nF and 470nF.

3. This allows us to get a square pulse of 5V every 0.9 seconds approximately. Which is slow enough to allow us to take readings from the resistor.