Hardware Assignment Report

EE22BTECH11210 - KUMAR ARYAN

COMPONENTS :

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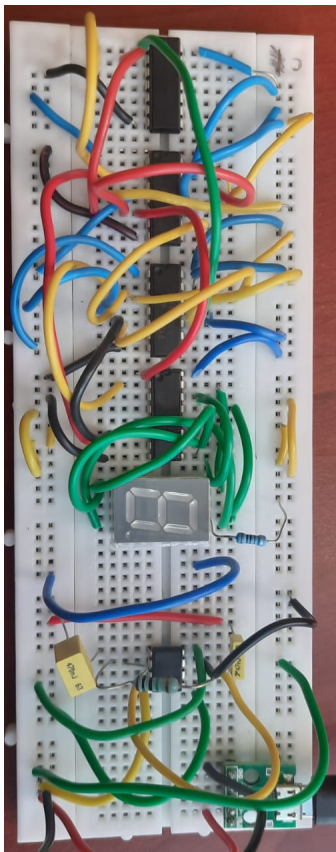11) Capacitor 47nF (≈)
12) Capacitor 470nF (≈)

DESCRIPTION :

Fig. 12. Circuit

Setup -

The above circuit uses 5V power source from 'USB micro B breakout board' which acts as VCC for the circuit. The clock signal is carried by the bus mentioned with 'c'(right most). The second last from right and last from left is for VCC and second last from left is for Ground (GND).

Circuit Overview -

1) The Flipflops take the clock input 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 once 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 and then the sequence will repeat itself.

Timer -

The time period can be changed using different combinations of resistors and capacitors. As the capacitor advised (10nF and 100nF or 100nF and 100nF) were not working properly, the capacitor used in their place are of 47nF and 470nF approx. This allows to get a square pulse of 5V every seconds approximately which is slow enough to take readings.
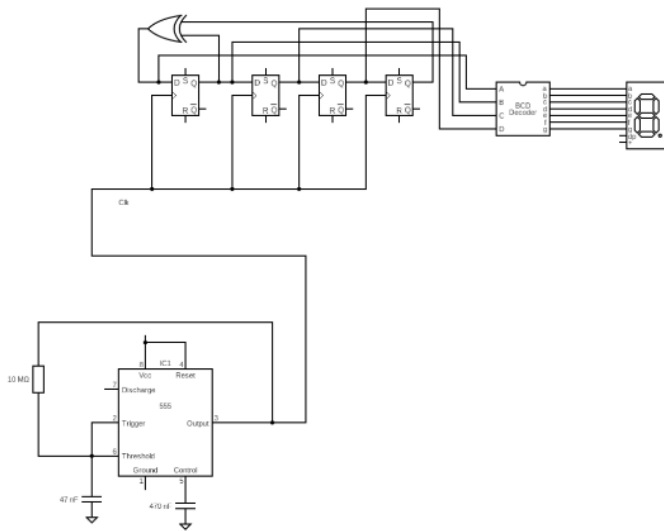
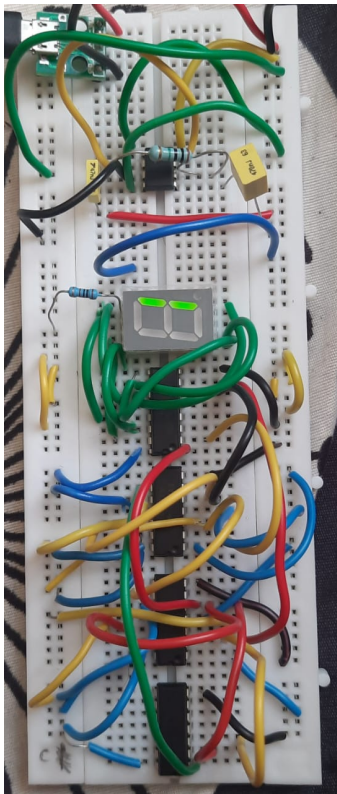BLOCK DIAGRAM AND WORKING PHOTO :

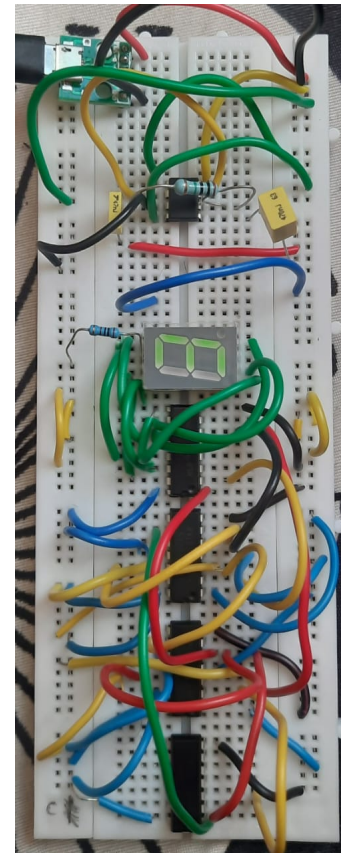Fig. 6.   Block Diagram

Fig. 6.   working photo 2

Fig. 6.   working photo 1