Hardware Project Report

Amitabha Ghosh
EE22BTECH11203

AIM :- To generate random numbers using shift resistors.

Components Used :-

1) Breadboard,
2) Seven Segment Display,
3) Decoder(7447),
4) Flip Flop(7474),
5) XOR Gate(7486),
6) 555 IC,
7) Resistors(10kΩ, 1MΩ, 10MΩ),
8) Capacitors(470nF, 1μF),
9) Wires,
10) Type-A USB connector.

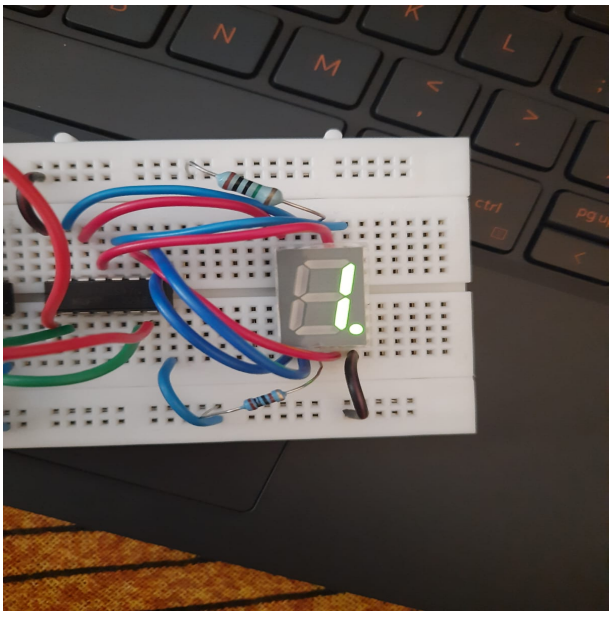
Procedure :- At first, we made the clock circuit using 555 IC, capacitors, and 1MΩ resistor. Then we placed the XOR Gate(7486), Flip Flops(7474), Decoder(7447) respectively on the breadboard. We made a common V_{cc} on both the sides of the breadboard by connecting the wires and similarly we made a common ground on the breadboard. We connected the pin 14 of XOR gate, pins 1, 4, 10, 13, 14 of both the Flip Flpos, pin 16 of the decoder to the common V_{cc}. Similarly, we connected the pin 7 of XOR Gate, of both the Flp Flops, and pin 8 of the Decoder to the common ground. Then we connected the clock output signal to the pins 3 and 11 of both the Flip Flops. Then we connected some pins internally with other pins. After that we connected the pins of the seven segment display with some of the pins of the decoder.

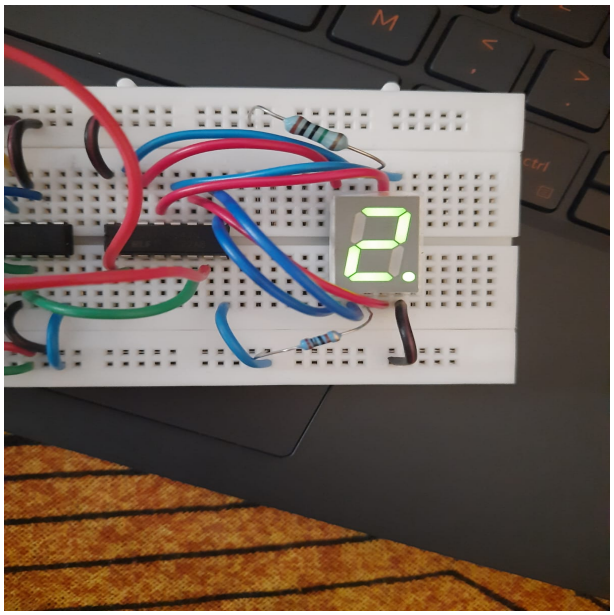
Description of the Circuit :- The 555 IC ia used to generate a clock signal. This clock signal is fed to each of the Flip Flops. After powering up the circuit, initially the flip flops produce random outputs. The outputs from both the flip flops are then fed to the XOR Gate and the outputs both flip flops are then sent to the decoder. Depending on the input the decoder then decides which segments of the Seven Segment should light up. Like, if the input to the decoder is 0100 then b, c, f, and g segments of the Seven Segment will light up.

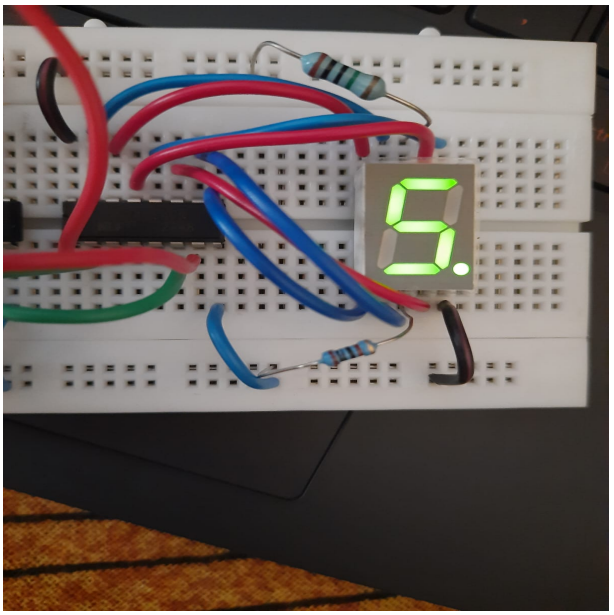
The output of from the XOR Gate is once again fed into the flip flops and this time we get a different random number. New random numbers are generated in this way untill the original number is obtained again. Now the same sequence of random numbers is generated again and again, this cycle repeats.

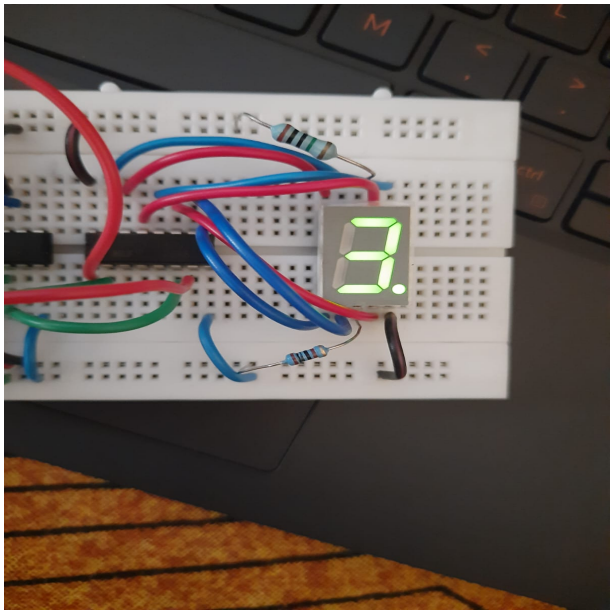
The purpose of the clock is to ensure that each number has enough time to display and doesnot change instantaneously as the propagation time of circuit for each cycle is very small. The clock does this by not letting the information propagation when the clock signal is low. The duration of this clock low period is determined by the values of the capacitor. When the capacitors are small, the clock period decreases and the random numbers are generated very fast. In this circuit to increase the display duration, the capacitors are taken of the order 10^{-6}. The circuit powered by a USB-Type A adapter.

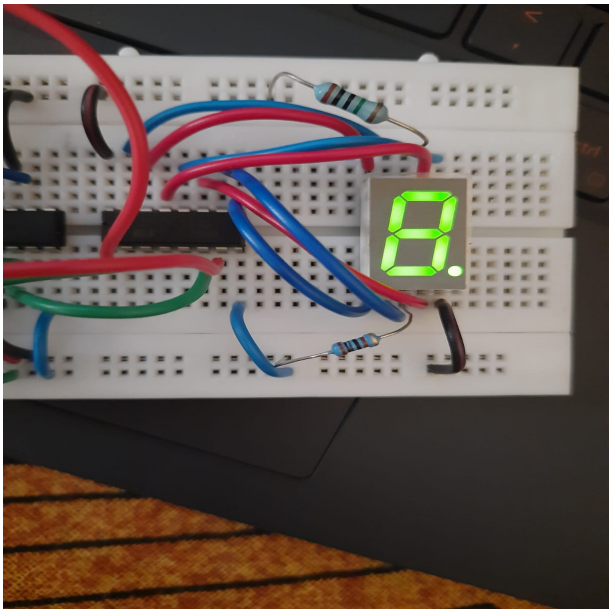
Output Pictures:- Here are the output circuit and results of the experiment-

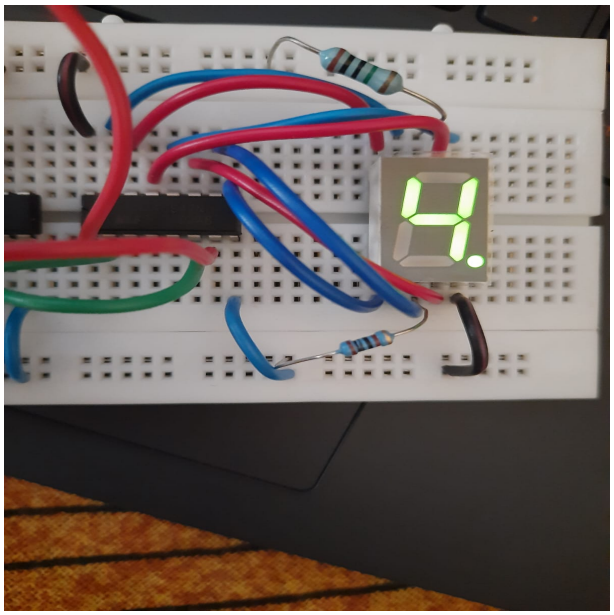


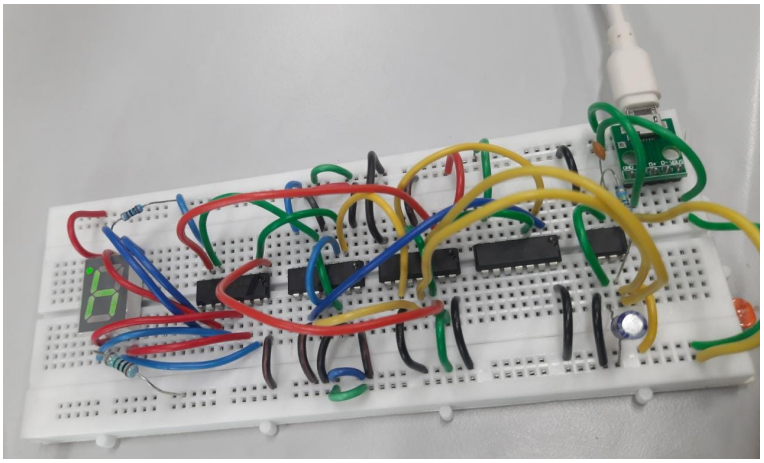

2.


5.

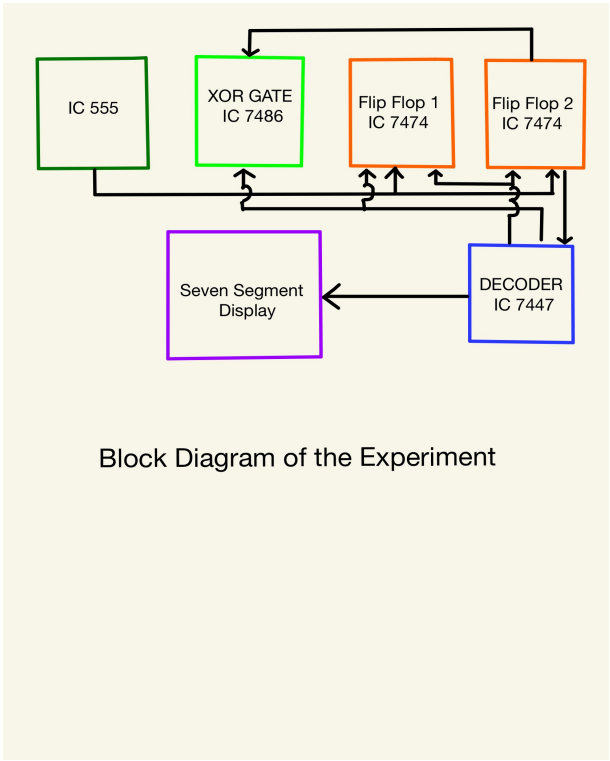

3.


8.


4.



Block Diagram of the Circuit :-



Block Diagram of the Experiment

Conclusion :- In this way we have created a circuit by using capacitors, resistors, flip flops, decoder, IC which generates random numbers using the seven segment display.