AI1110 (Hardware Project)
Random Number Generator

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***Abstract*—Here, we have made a Random Number Generator using shift registers.**

Components used

Component	Value	Quantity
Seven Segment Diplay	Common Anode	1
X-OR Gate	7486	1
555 IC		1
Decoder	7447	1
Flip Flop	7474	2
Breadboard		1
Resistor	1 KΩ	1
Capacitor	100 nF	1
Capacitor	10 nF	1
Jumper Wires		20

Procedure

1) connect the 555 timer circuit to generate a Square Waveform Output as shown in Fig. 1.

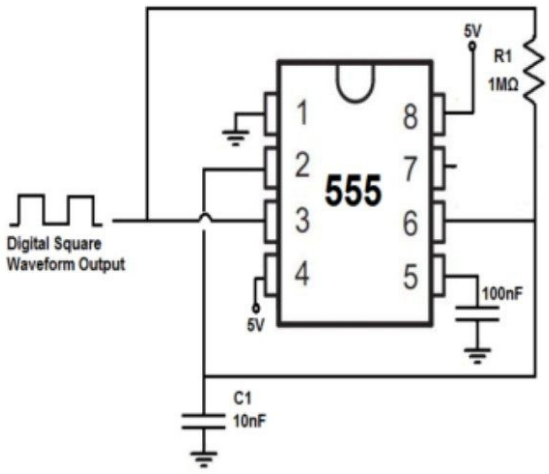

Fig. 1. 555 timer circuit

2) Then, provide the Square Waveform generated from the above shown 555 timer circuit is provided to D-Flip flops.
3) Now, make the circuit for shift registers using 4 D-Flip flops. Below shown are the connections of two 7474 ICs (Fig. 2).

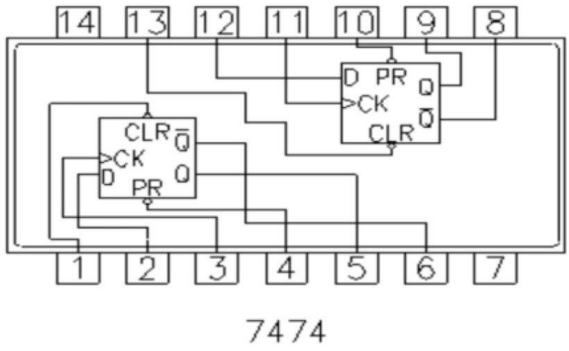

Fig. 2. 7474 IC connections

4) Connect the XOR gate (7486 IC) to the system of D-Flip flops (shift register) accordingly as shown in the Fig 3.

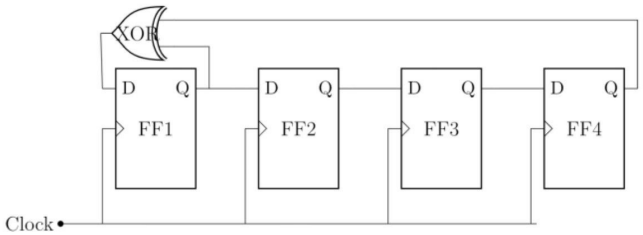

Fig. 3. XOR gate connections

5) Then connect the decoder (7447 IC) and connect its A,B,C,D with Q_0,Q_1,Q_2,Q_3 (outputs of the D-Flip flops) respectively as shown below in Fig. 3.
6) The seven segmented display is then connected with the decoder (7447 IC) according to Fig 5 and Fig 6.
7) And finally, connect all the independent parts with each other and then connect the circuit to the power source.

Fig. 4. Connection in Decoder gate

7447	$\bar{a}$	$\bar{b}$	$\bar{c}$	$\bar{d}$	$\bar{e}$	$\bar{f}$	$\bar{g}$
Display	a	b	c	d	e	f	g

Fig. 5. Connection of seven segmented display with decoder

Output

Random digits are generated continuously on the seven segment display. The Output is shown in the following figures (Fig 7, 8, 9, 10).

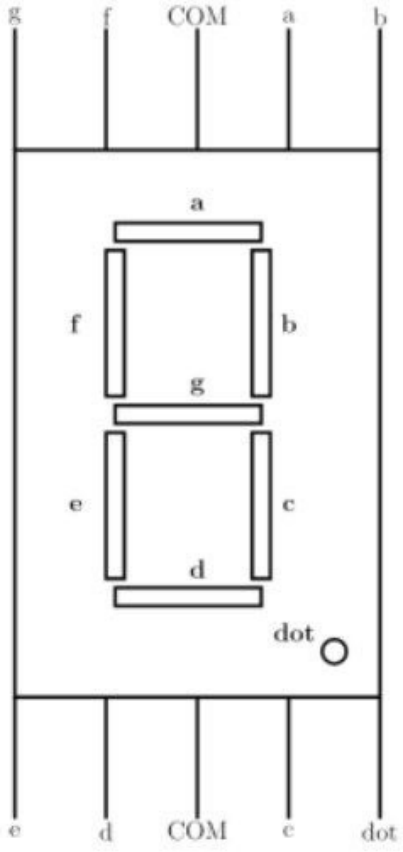

Fig. 6. Seven segmented display

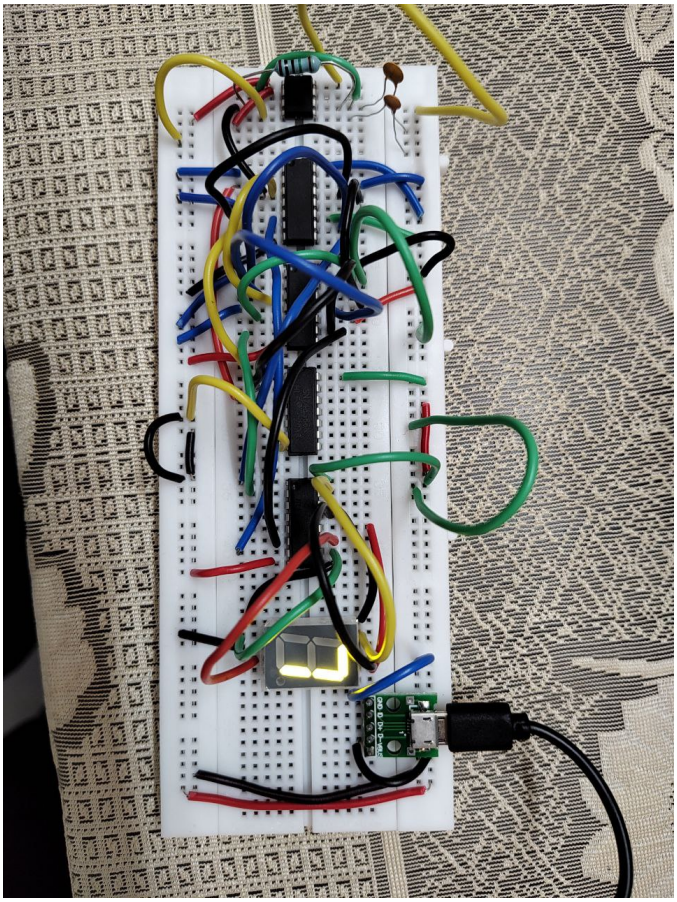

Fig. 7. Output1

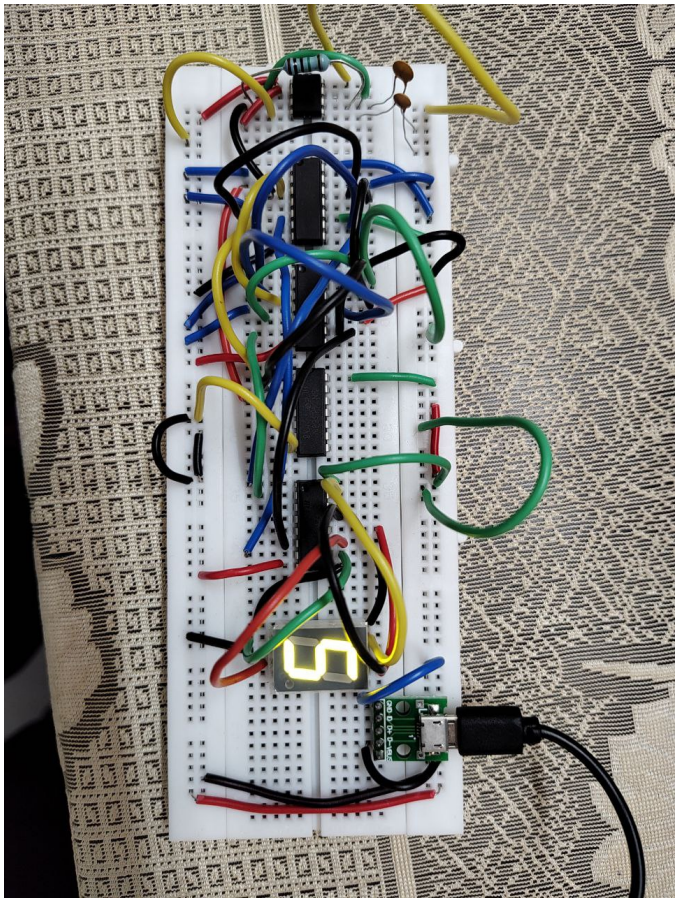

Fig. 8. Output2

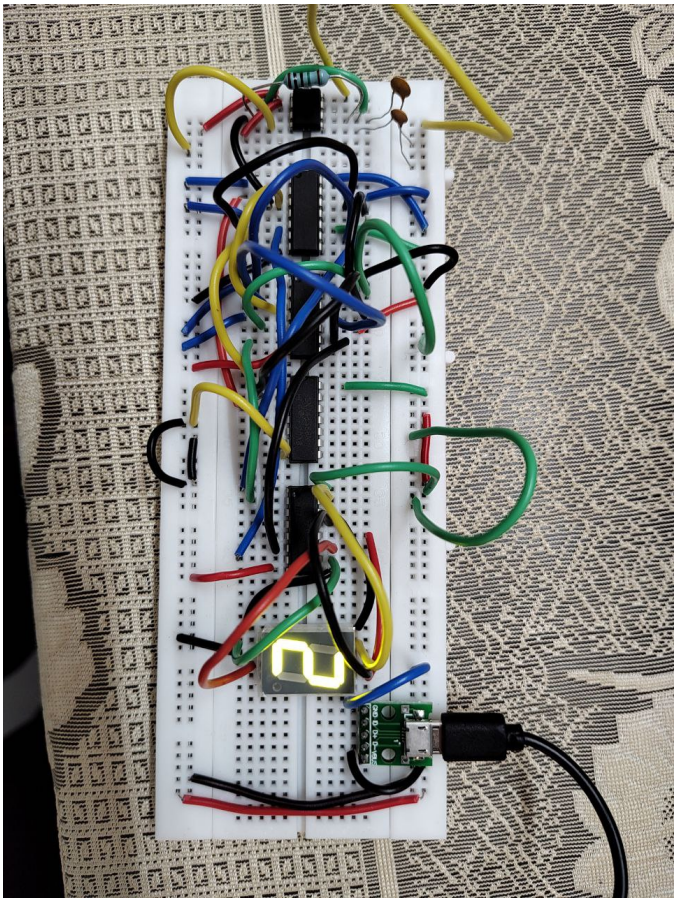

Fig. 9. Output3

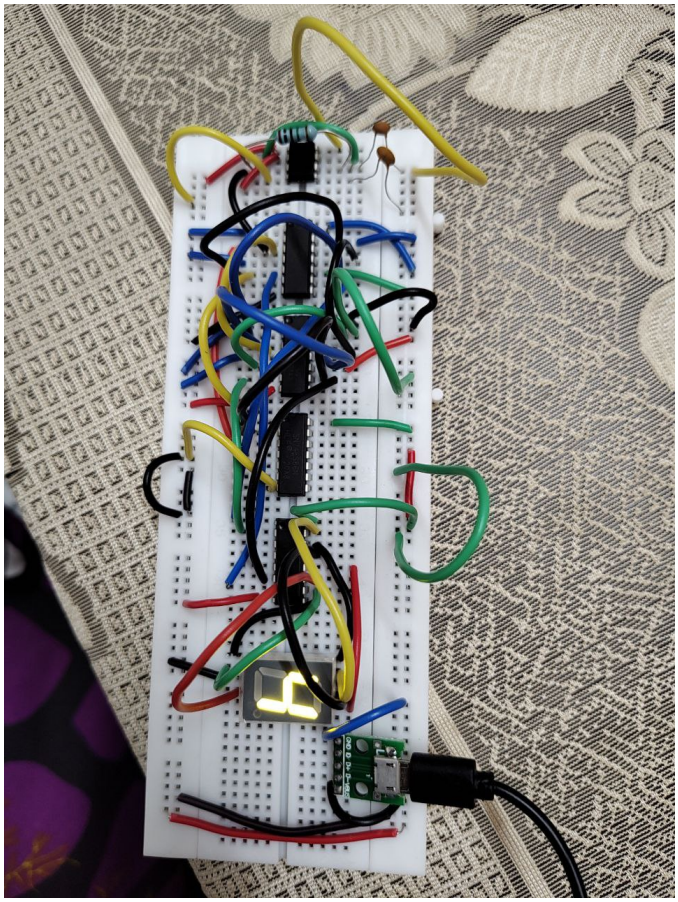

Fig. 10. Output4