Hardware Project Report

Shirsendu Pal
CH22BTECH11033

1 AIM:-

To generate random numbers using shift registers.

2 Components Used:-

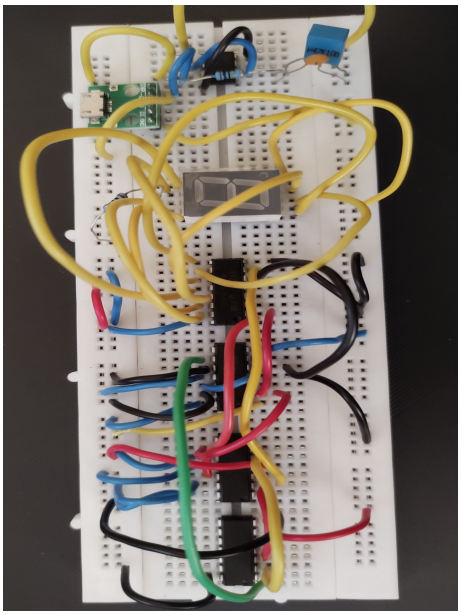
1) Breadboard,
2) Seven Segment Display,
3) Decoder (7447),
4) Flip-Flop (7474),
5) XOR Gate (7486),
6) 555 IC,
7) Resistors ($10k\Omega, 1M\Omega, 10M\Omega$),
8) Capacitors ($470nF, 1\mu F$),
9) Wires

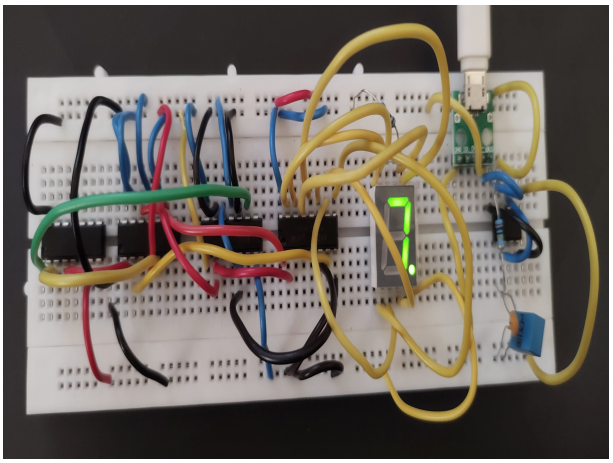
3 Procedure:-

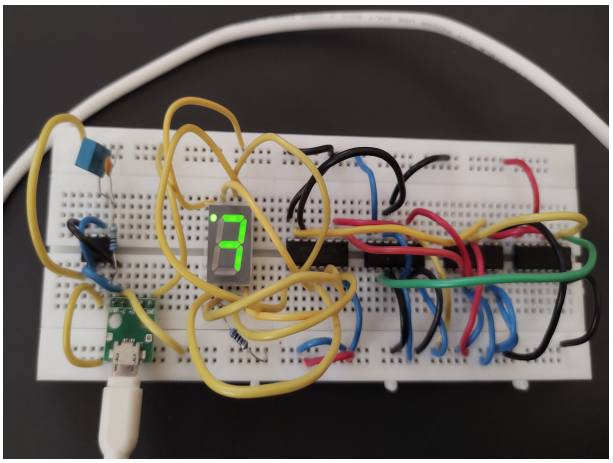
At first, we setup the clock circuit using the 555 IC, capacitors and $1M\Omega$ resistor. Then we placed the XOR (7486) gate, Flip-Flops (7474) and Decoder (7447) respectively on the bread board according to the circuit diagram provided. Then we placed the USB-A power adapter on a corner of breadboard and made a common V_{cc} on one rail of the breadboard. Similarly, a common ground rail was established on the breadboard from the USB-A adapter. Then we established connections of V_{cc} and ground with the 555 IC and measured its output using Oscilloscope. We received a square wave-form and proceeded to make connections of the XOR, Decoder and Flip-Flops according to the circuit-diagram. Then we made connections of the components with the clock, V_{cc} and ground. Finally, we placed the 7-segment display and plugged the connections to the V_{cc} and the decoder pins 9 through 15.

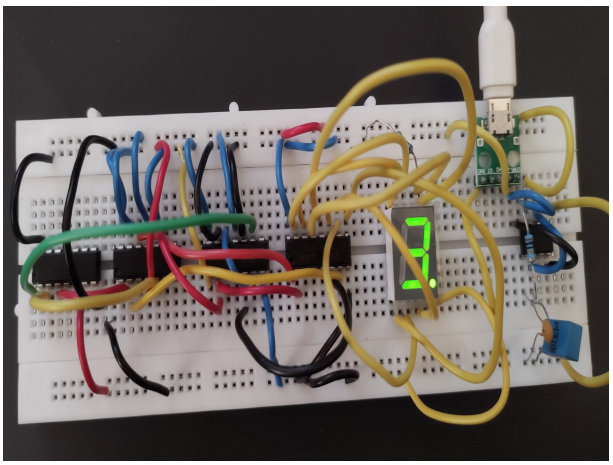
4 Description of Circuit :-

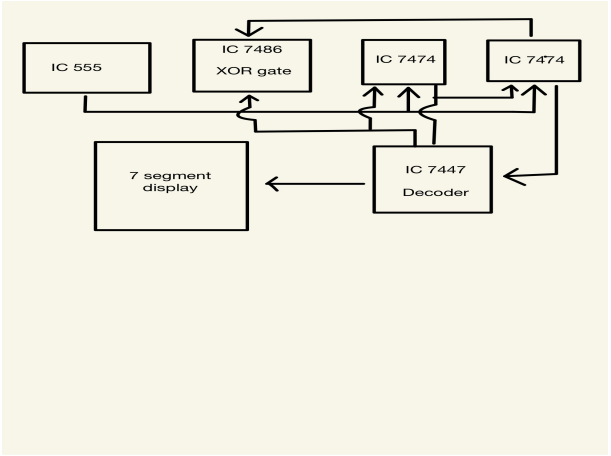
In the circuit the 555 IC acts as a clock, outputting square wave-forms. The clock output is fed to the 2 IC 7474 (each IC has 2 Flip-Flops). After powering up the circuit using a USB-Type A adapter, the Flip-Flop produces random output. The out-put from the 1^{st} and last Flip-Flop are fed into the XOR gate and outputs of all Flip-Flops are fed into the Decoder (IC 7447). The decoder lights up the segments of the 7 segment display depending upon the input it receives. For example, if the input to decoder is 1000 then the Decoder lights up all (a, b, ..., g) segments of the 7 segment display.
The previous output from the XOR is fed into the flip-flops again and the process is repeated to get another output from the Decoder and thus, a new random number is displayed on the 7 segment display. This process generates unique random numbers until the first input number is otained and the cycle repeats.
The clock also acts as a delay period for the next random number to generate and display on the 7-segment display. The clock does so by not letting the signal pass when the current is low. This clock low period is determined by the size of the capacitor. Lower the capacitance, lower is the delay. So we have used capacitor of the order of 10^{-6}.
It is also necessary to connect every component with V_{cc} and Ground to run them. The brightness of the 7-segment display depends on the value of V_{cc}. The larger it is, the brighter the display is.











5 Block Diagram :-

: The Block Diagram of the circuit of this experiment is as follow.