Institute of Space Technology Islamabad

Digital Logic Design Lab

PROJECT

Title: **Digital Clock using 555 timer IC.**

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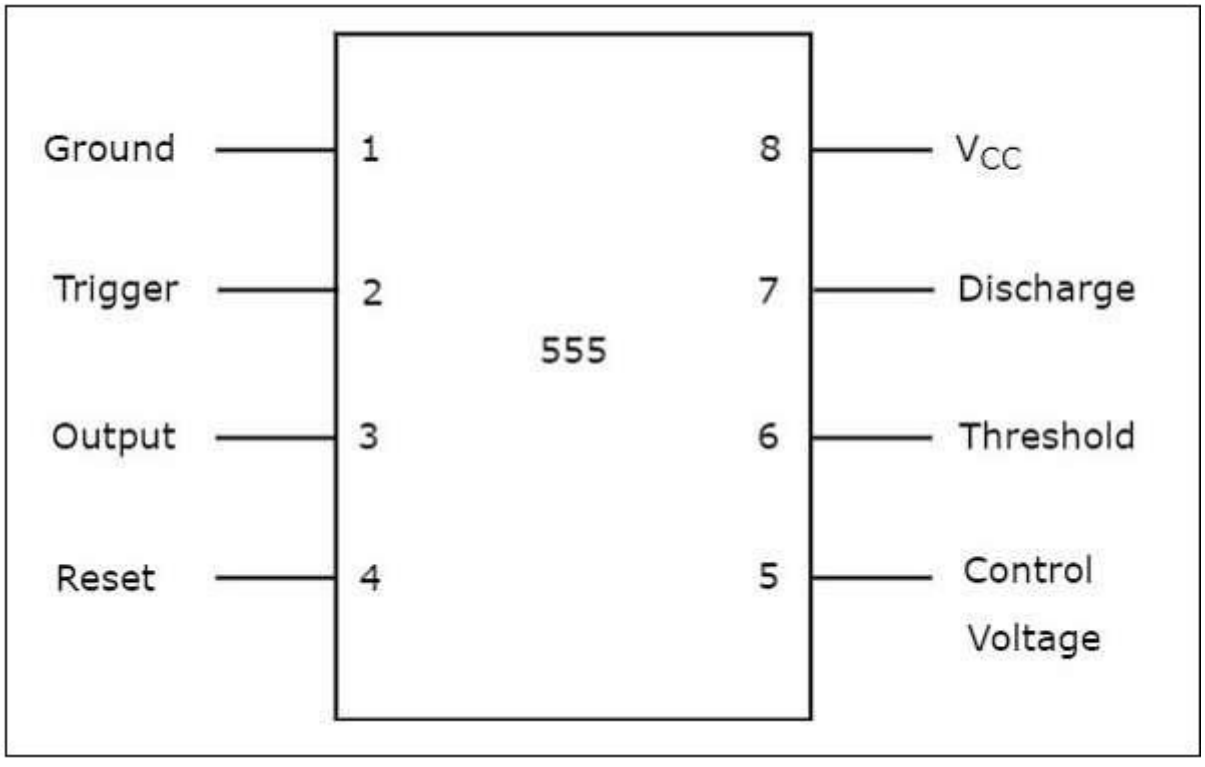
Components:

- 555 Timer IC
- 4026 7-Segment Decade Display Counter IC
- 7 segment display (common cathode)
- 7411 Three-Input AND Gate
- Resistors (470 Ohm and 470k Ohm)
- Capacitor (2.2 microFarad)
- Push Switches
- Battery or Power Supply

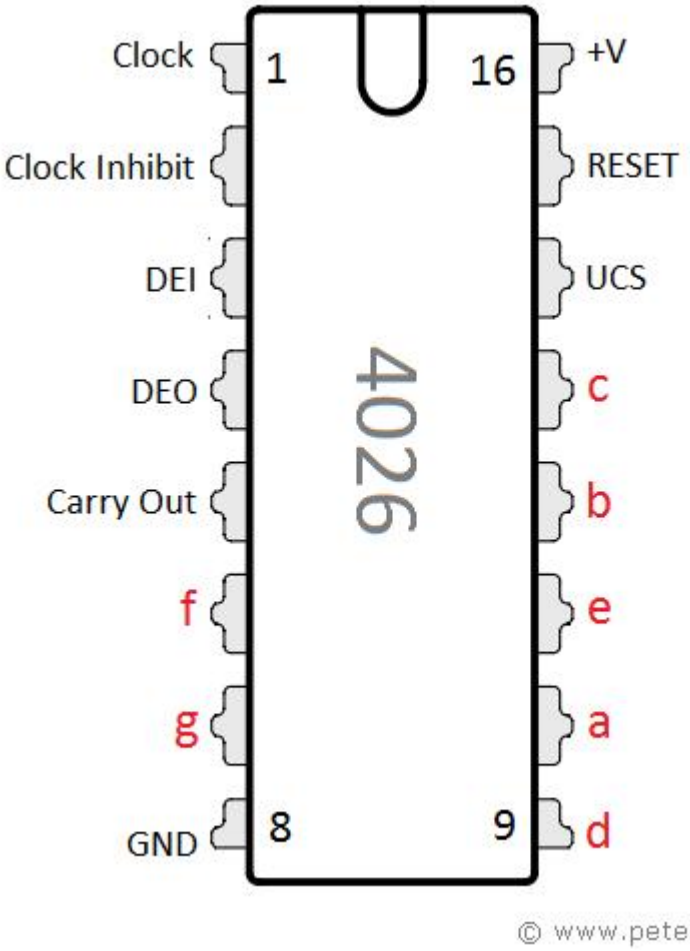
1. 555 Timer IC:

   It is used to generate a clock. The frequency of the clock generated depends upon the ratio of the capacitor and the resistor connected to the IC. To make the output frequency roughly equal to 1s, we connected a capacitor of 2.2 microFarad and a resistor of resistance 470k Ohm.



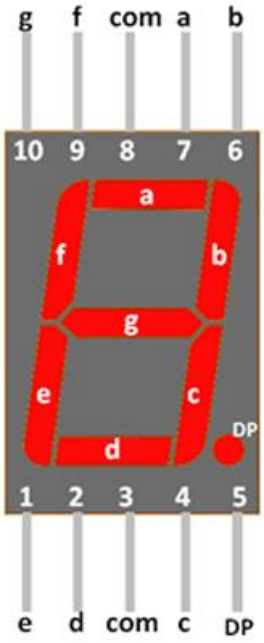
2. 4026 7-Segment Decoder:

It is used to control the 7 segment displays, and is a decade counter. It has a carry-out pin, which gives a high when the count reaches 10 (when segment output increments one in 9), which can be used as a clock signal for the next 4026 IC.



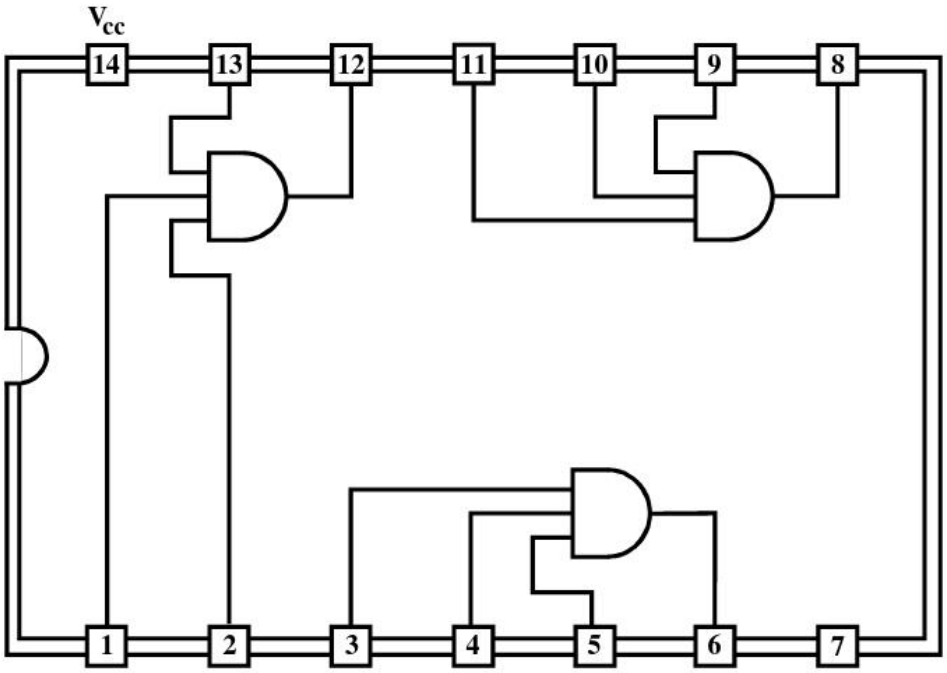
3. <u>7 segment display:</u>

7 segment displays of common cathode type are used to display the time, and are connected to the 4026 IC.



4. <u>7411 three-input AND Gate:</u>

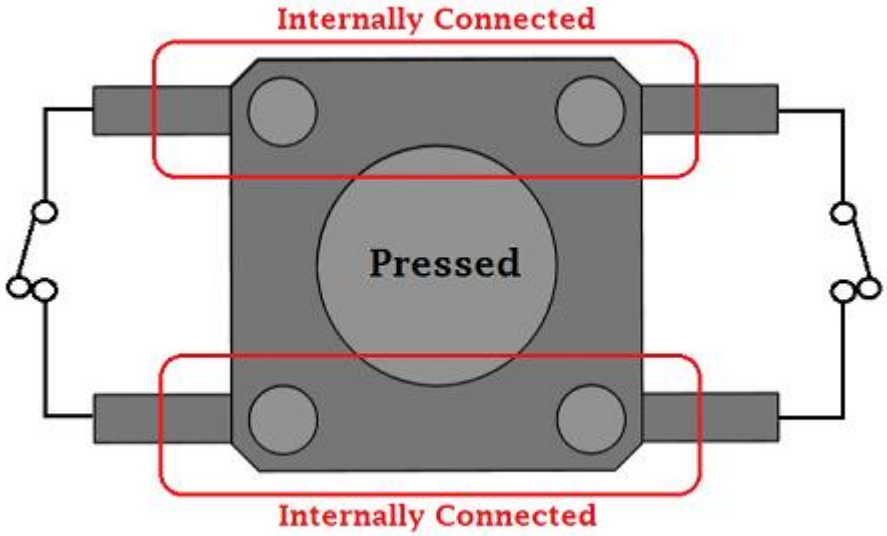
Three input AND gates are used to stop the clock at specific signals. First one is used to stop the tens of seconds at 6 (reset seconds after 59). It is done by connecting the inputs of AND gate to e, f, and g segments of 4026 IC, which are simultaneously lit only when 6 comes on. And the output is connected to the clock of next IC, as well as the reset of IC controlling seconds. The second AND is connected in similar fashion to the tens of minutes. The third AND is connected to hours, but in a different way. Hours are to be stopped at 24, so inputs of AND are connected to f and g of 5^{th} IC, and g of 6^{th} IC. Output is connected to Reset of both.



7411: TRIPLE 3-INPUT AND

5. Push Buttons:

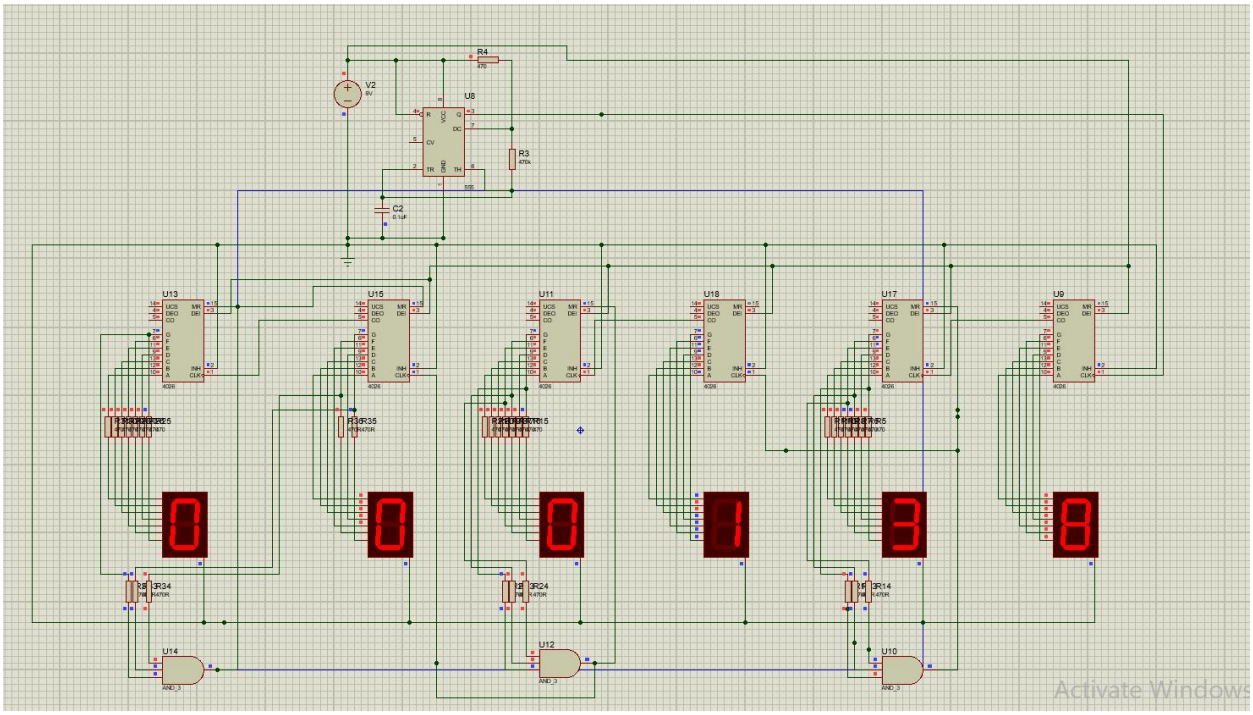
Push buttons are used to manually set time to a fixed value. They are connected to the clock of 3rd and 5th IC, to set hours and minutes by an increment of 2.



6. Battery:

A 9V battery is used to power the circuit.

Circuit:



Working:

1. The 555 timer IC generates a clock signal of frequency 1Hz.

2. The signal is transferred to the 1st 4026 IC, which generates a new second for each clock, hence counting the seconds.

3. The carry output of 1st 4026 is given to the 2nd 4026 as clock.

4. The carry of 1st 4026 becomes high when the IC counts through 0 to 9 once.

5. The 2nd 4026 takes the carry of 1st 4026 as clock, and hence gets an increment after every 10 seconds.

6. As we have to stop seconds at 59, the 2nd 4026 is connected to an AND gate. The e, f, and g outputs of 2nd 4026 IC are connected to the AND gate.

7. These three outputs only get high when 6 is written, so at 60, the AND gate gets high.

8. The output of AND gate is connected to the Reset pin of 2nd IC (which resets the output of IC from 6 back to 0) and the clock of 3rd IC (which increments 1 minutes for every 60 seconds).

9. The same layout is done for minutes part.

10. For hours, there is some difference, because hours will only run till 12 or 24. In our case, the clock is 24-hour clock, so we will connect the f, and g of 5th IC, and g of 6th IC to an AND gate, as they only get high simultaneously when 24 is printed.

11. The output of this AND gate is connected to the RESET pins of both 5th and 6th IC.