Working of 555 Timer (Unit IV)

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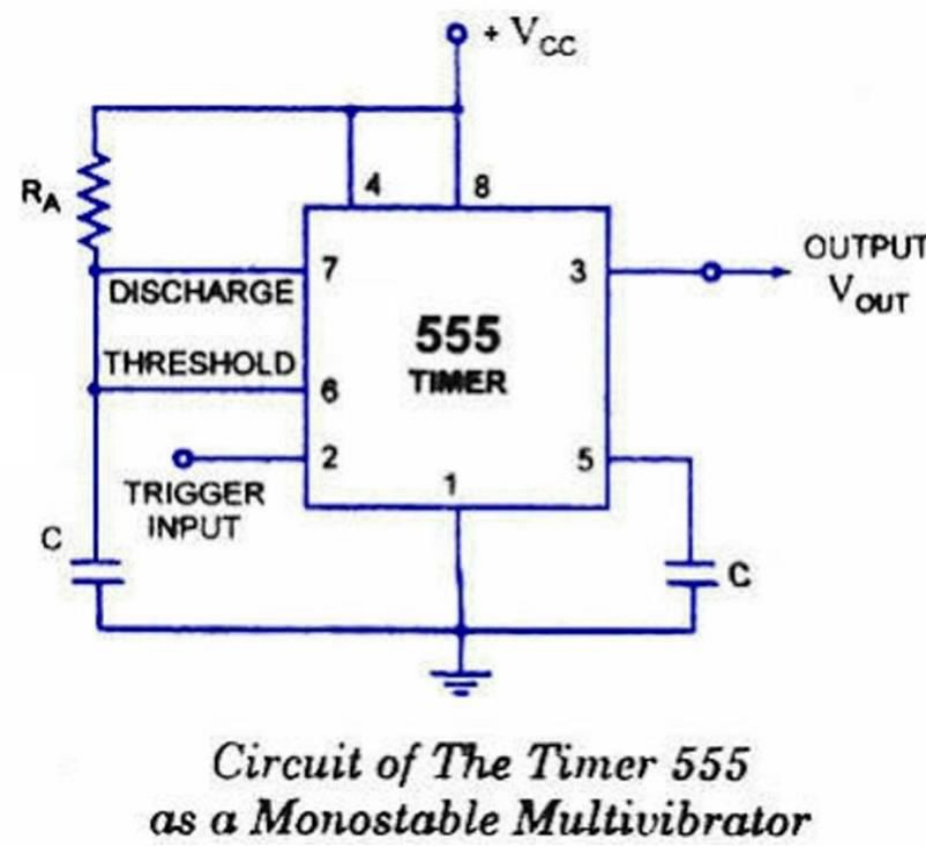
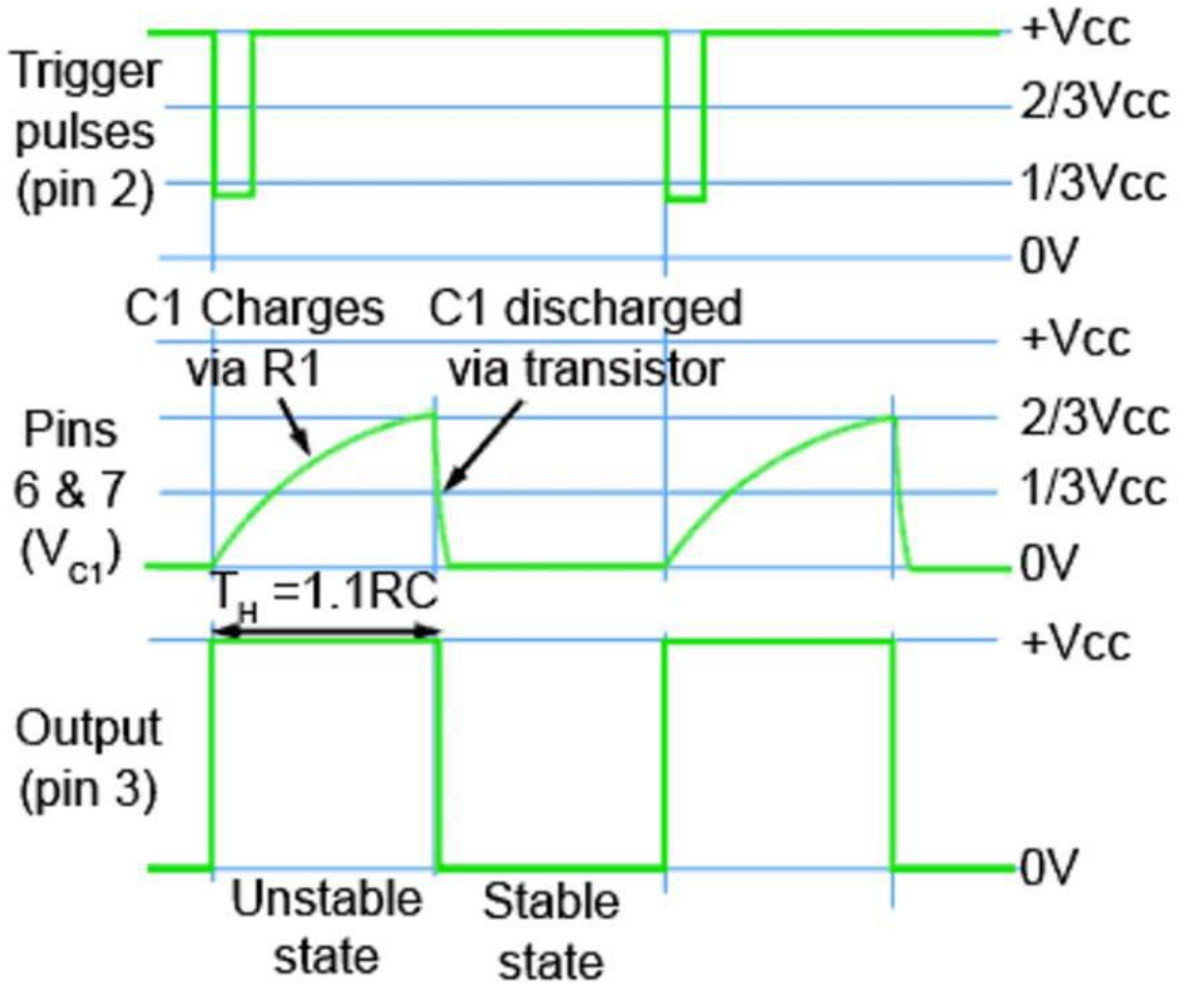
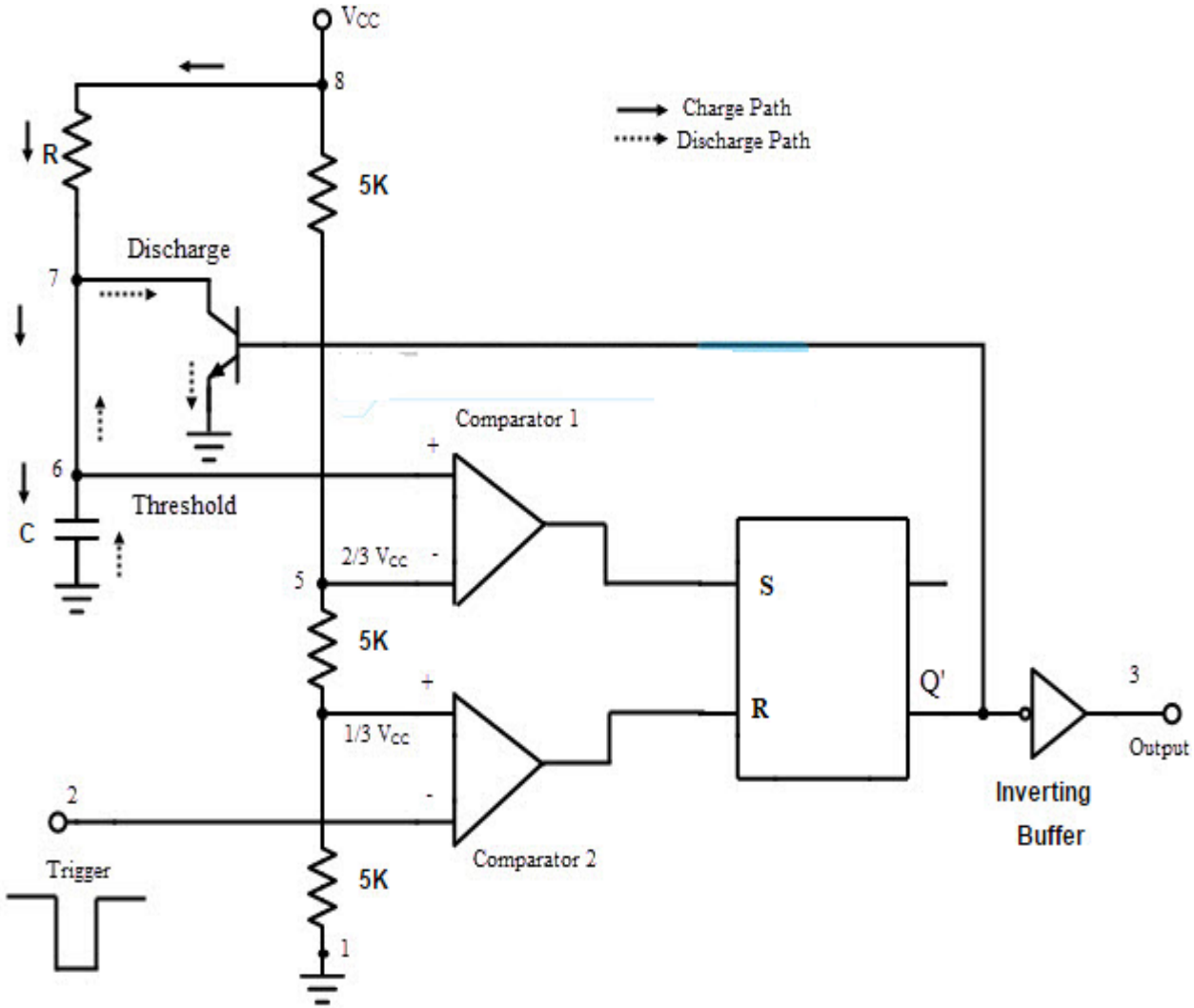
555 as mono stable mode

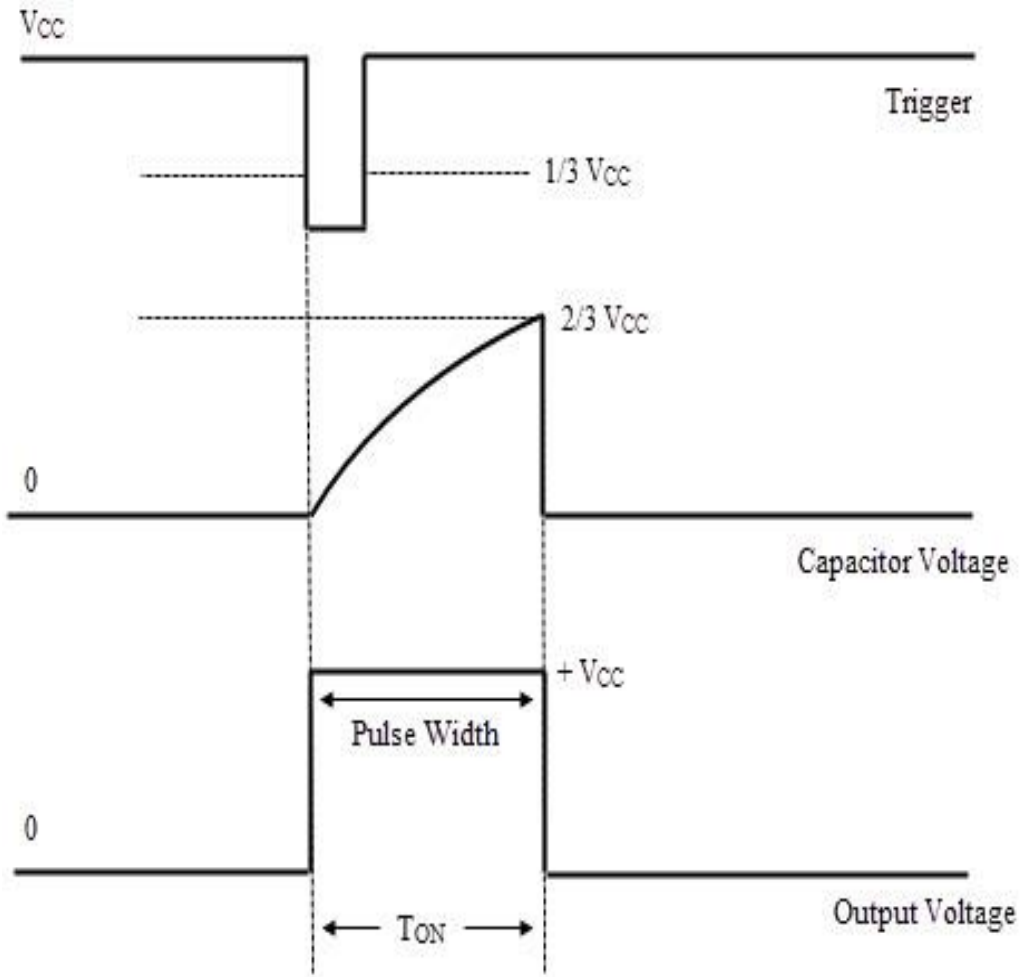


Circuit of The Timer 555 as a Monostable Multivibrator



555 as Mono stable operation





Derivation of monostable multivibrator

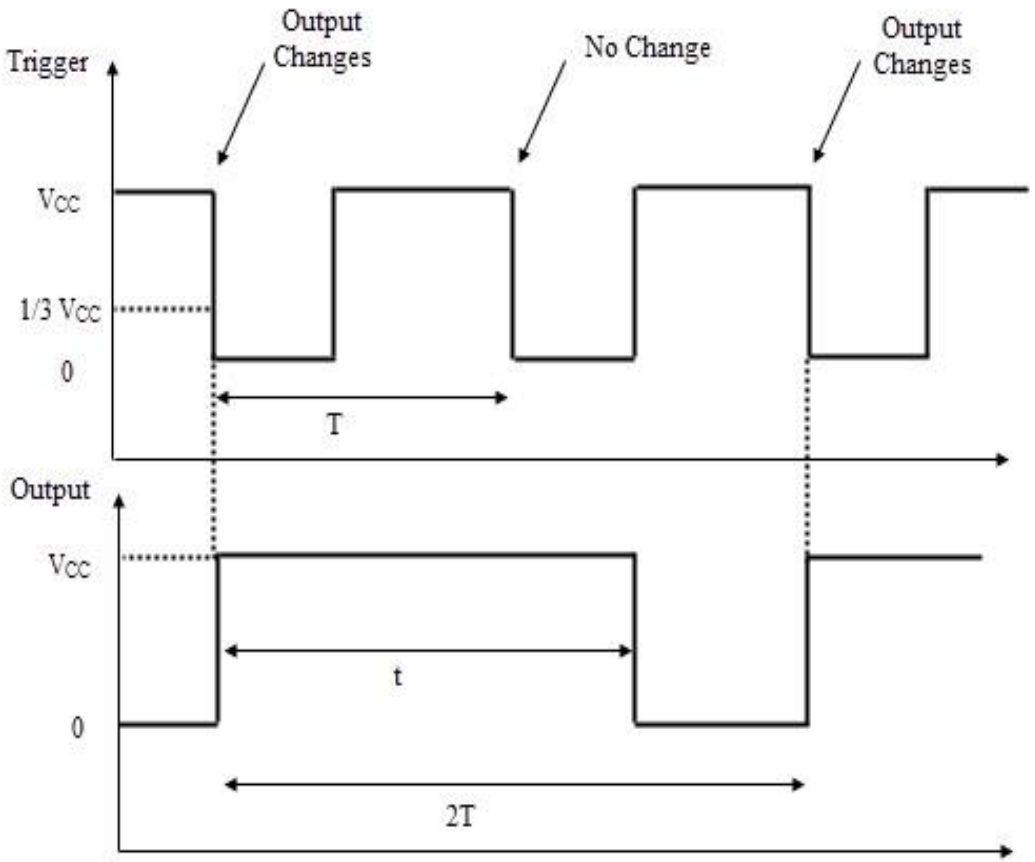
- $VC = VCC\ (1 - e^{-t/RC})$
- When the capacitor voltage is 2/3 VCC, then
- $2/3\ VCC = VCC\ (1 - e^{-t/RC})$
- $2/3 = 1 - e^{-t/RC}$
- $e^{-t/RC} = 1/3$
- $- t/RC = \ln (1/3)$
- $- t/RC = -1.098$
- $t = 1.098\ RC$
- $\therefore t \approx 1.1\ RC$
- The pulse width of the output rectangular pulse is $T = 1.1\ RC$.

The monostable multivibrator will act as a Linear Ramp Generator with the addition of a constant current source.
A current mirror, consisting of a diode and a PNP transistor, is used as a Constant Current Source.
This constant current source is positioned in place of the timing resistor.

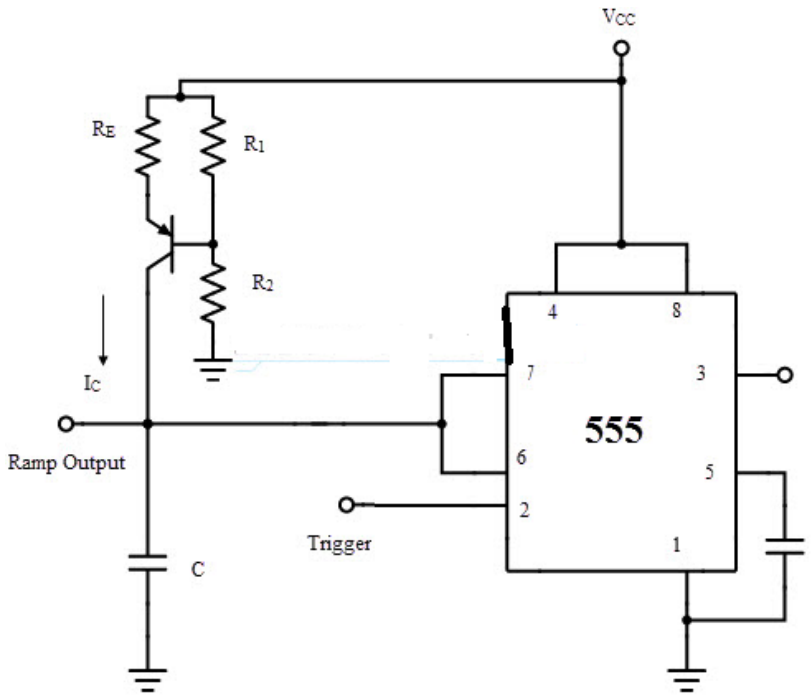
The current IC from the constant current source will charge the capacitor at a constant rate towards the peak voltage (VCC) resulting in a rising linear ramp.
As the voltage across the capacitor reaches 2/3 VCC, the comparator 1 will drive the discharge transistor to saturation.
As a result, the capacitor starts discharging. While discharging, as the voltage across the capacitor falls to 1/3 VCC, the comparator 2 will turn off the discharge capacitor. Hence the capacitor will start charging again. The discharge time of the capacitor is very less when compared to the charging time.
As a result, the downward ramp is very steep (almost an immediate discharge). Hence, the time period of the ramp output is practically equal to the charging time of the capacitor. The time period of the ramp output is approximately given by

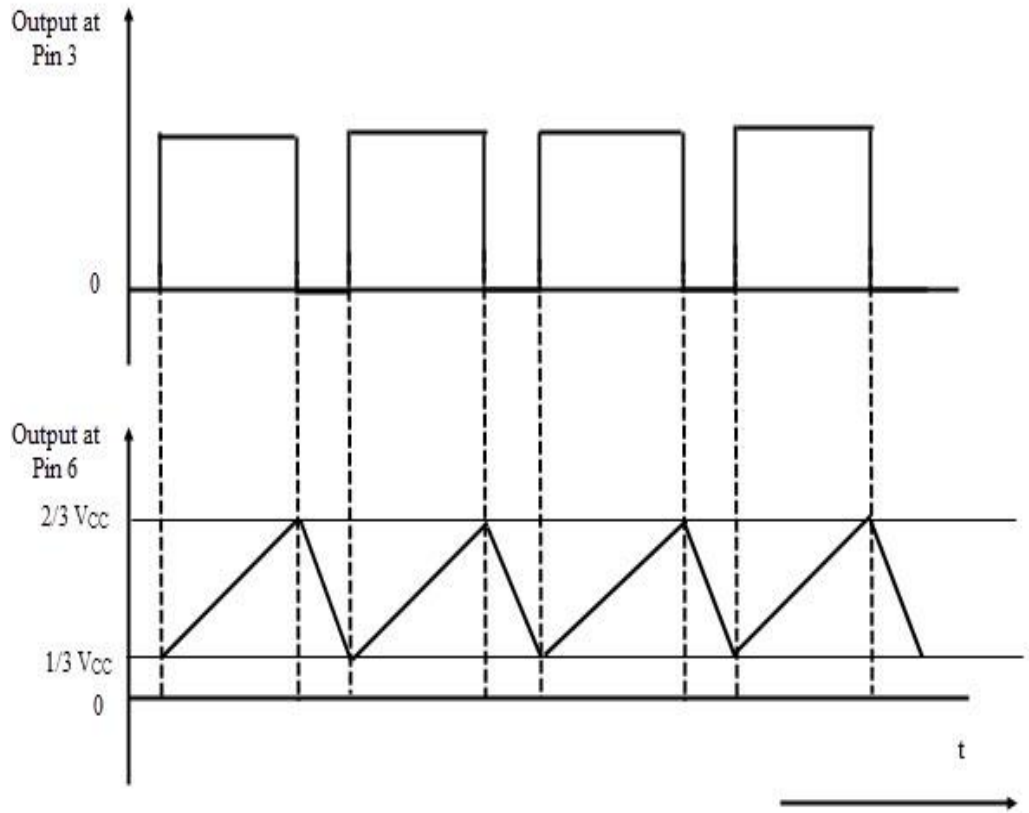
Applications of Monostable Multivibrator

- **Frequency Divider Divide by 2 circuit**.
- If the timing interval t is made slightly larger than the time period of the input pulse (trigger pulse), the device can act as a Divide – by – two circuit.
- The timing interval can be controlled by appropriately choosing the values of the resistor R and the capacitor C in the timing circuit.
- t > 1.2 T
- Where t= 1.1. R.C
- T :time period of trigger pulse
- T: turn on time of 555 timer



2. Linear Ramp Generator

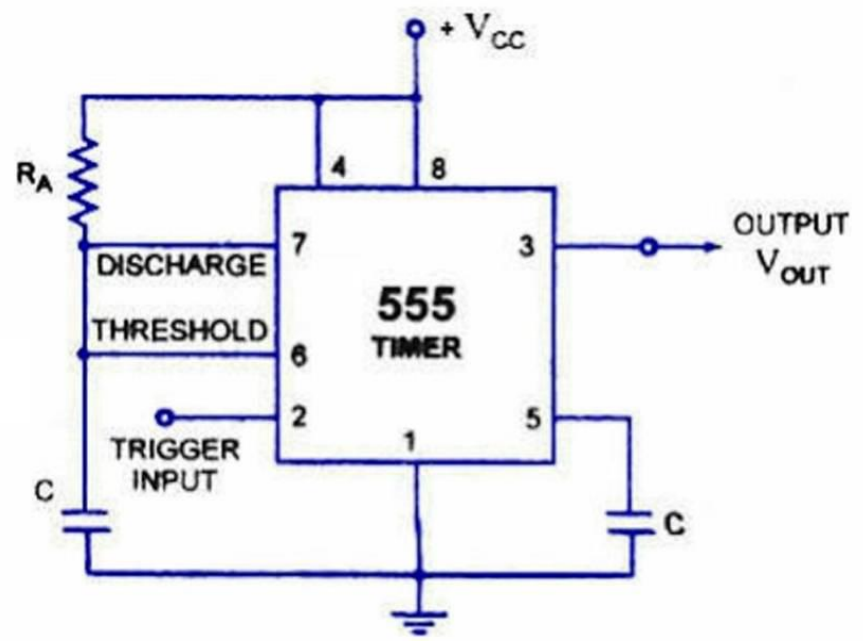




Design a monostable for tp=1 m.s interval and draw the ckt diagram

- Tp=1.1 R.C

- Given Tp=1 m.s
- Assume c=0.1 uf
- Calculate value of R
- Substitute value of Ra with R
- And C with the calculated value and draw the circuit diagram



Circuit of The Timer 555 as a Monostable Multivibrator

Design % 2 network if trigger frequency is 500Hz

Given T= 1/f= 1/500

T= 2m.s

To obtain 250 hz frequency output

Tp>1.2 * T

Tp=1.2*2 =2.4 m.s

Tp= 1.1 .R.C= 2.4 m.s

Assume C = 0.1 uF

And design R

THANK YOU