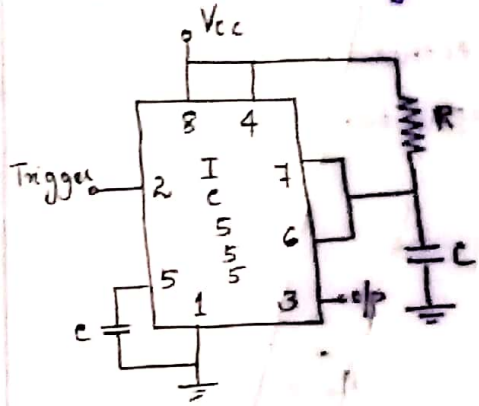
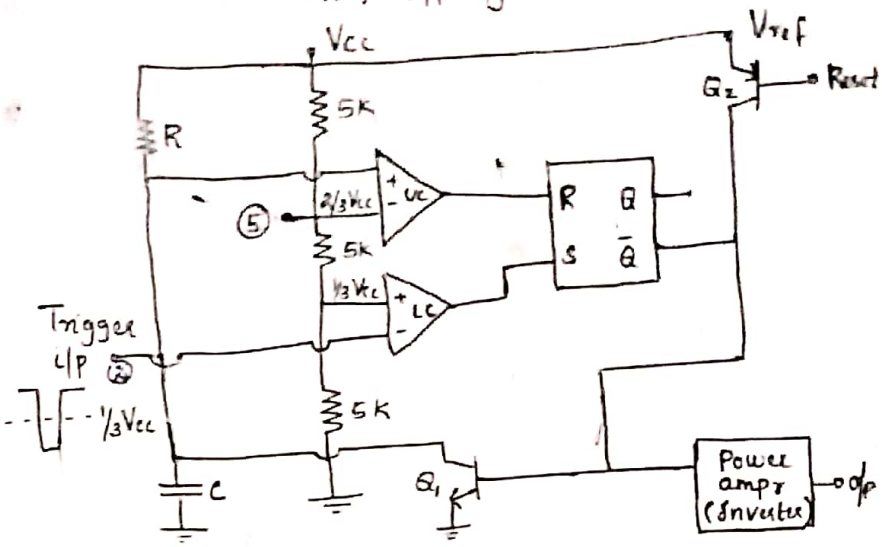
passes through $\frac{1}{3}V_{cc}$ at -ve i/p of LC, the LC comparator o/p is one and the FF is set i.e $\bar{Q} = 0$. This makes Q_1 OFF and short circuit across C is released. As $\bar{Q}$ is LOW, o/p goes HIGH. The timing cycle now begins.





Since C is unclamped, the voltage across it rises exponentially through R towards V_{cc} with a time const RC. After a time period T the capacitor voltage is just greater than $\frac{2}{3}V_{cc}$ and the UC resets the FF. This makes $\bar{Q} = 1$, Q_1 turns ON thereby discharging the capacitor C rapidly to gnd potential. The o/p is zero & returns to a stand by state.

The voltage across the capacitor $V_c = V_f + (V_i - V_f)e^{-t/RC}$

$V_f = V_{cc}$ & $V_i = 0$ $\therefore V_c = V_{cc}[1 - e^{-t/RC}]$

at $t = T$, $V_c = \frac{2}{3}V_{cc}$

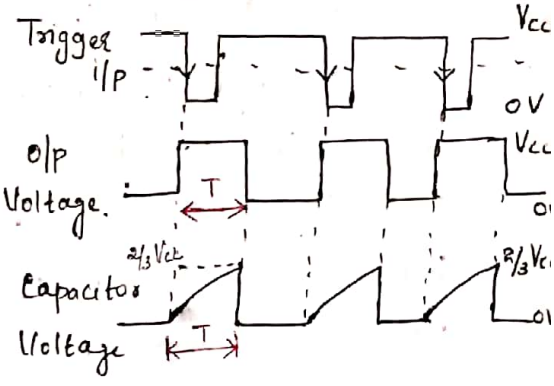
$\therefore \frac{2}{3}V_{cc} = V_{cc}[1 - e^{-T/RC}]$

$\frac{2}{3} = 1 - e^{-T/RC} \Rightarrow e^{-T/RC} = \frac{1}{3}$

$-T/RC = \ln \frac{1}{3} = -1.098$

$T = 1.1RC$ Seconds

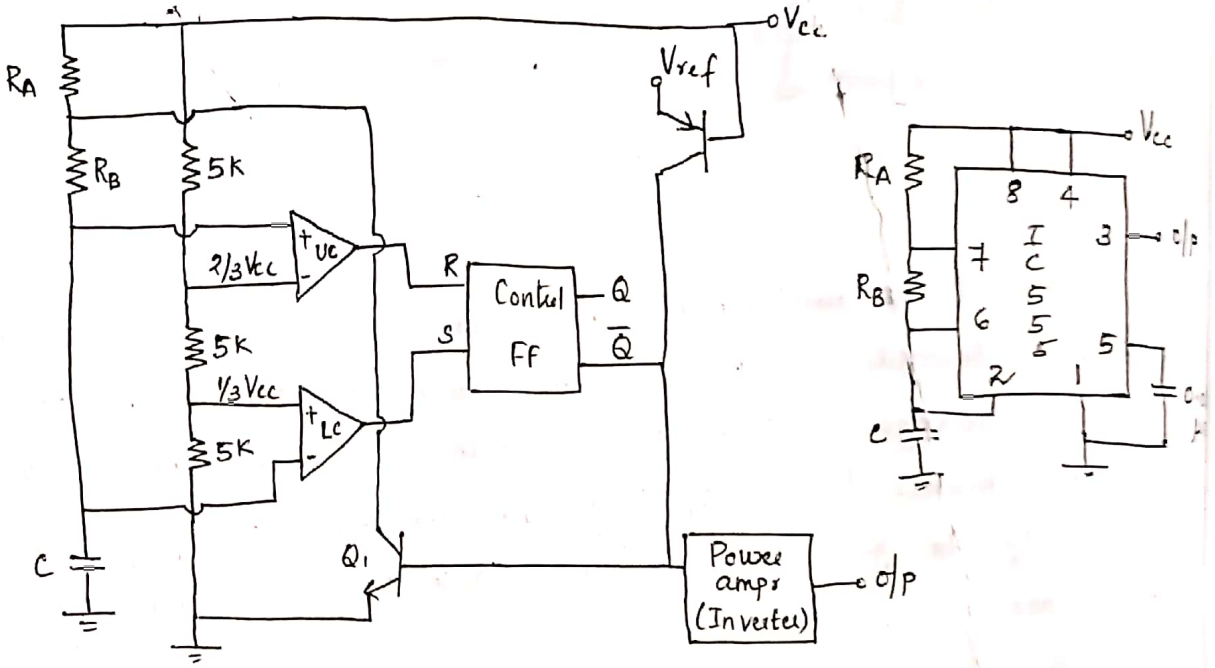
The timing interval is independent of the supply voltage. One triggered, o/p remains high until the time T elapses, which depends on R and C. Any additional trigger coming during this time will not change the o/p state. But if a reset signal is applied the 555 circuit will be in reset condition and o/p is zero.



ASTABLE MULTIVIBRATOR USING IC 555

An astable Multivibrator often called a free running multivibrator. It does not require an external trigger to change the state of the o/p, hence the name free running.

The time during which the o/p is either high or low is determined by two resistors and a capacitor which are externally connected to the 555 timer.



Working:

When the power supply V_{cc} is connected the external timing capacitor C charges toward V_{cc} with time Const $(R_A+R_B)C$. During this time the o/p is equal to HIGH (ie initially the capacitor voltage is zero and o/p of UC is LOW and o/p of LC is HIGH ie R=0 and S=1, FF sets ie $\bar{Q}=0$ and o/p = 1).

When the capacitor voltage is just greater than $\frac{2}{3}V_{cc}$ the UC triggers and R=1 which resets the FF and $\bar{Q}=1$. Hence o/p is zero. This in turn make Q_1 ON and the capacitor starts discharging towards ground through R_B and Q_1 with a time Const R_BC

During the discharge the capacitor voltage is just less than $\frac{1}{3}V_{cc}$, the LC is triggered ie S=1 and R=0 which turns $\bar{Q}=0$ and o/p = 1 The Capacitor C is thus periodically charged and discharged between $\frac{2}{3}V_{cc}$ and $\frac{1}{3}V_{cc}$ respectively. The length of time that the o/p remains HIGH is the time for the capacitor charge from $\frac{1}{3}V_{cc}$ to $\frac{2}{3}V_{cc}$