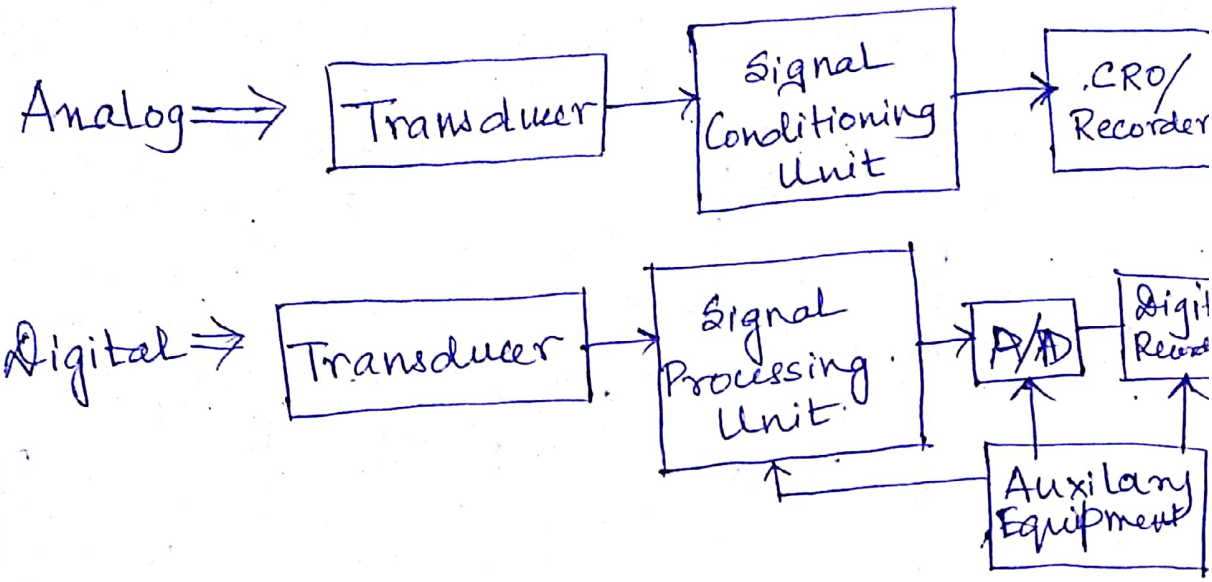
Electronic Measurement And Instrumentation:

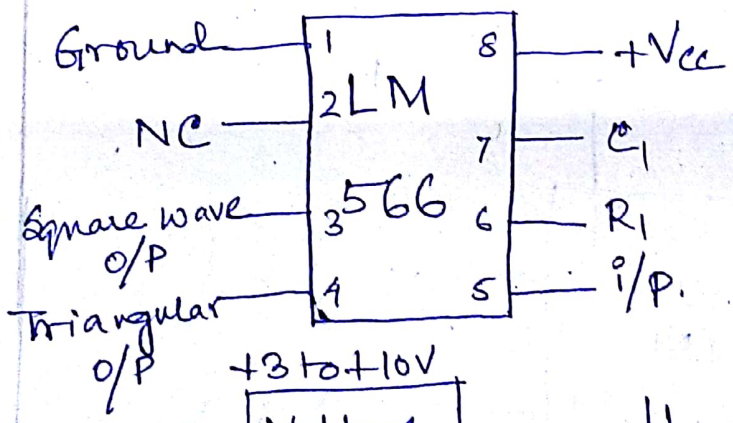


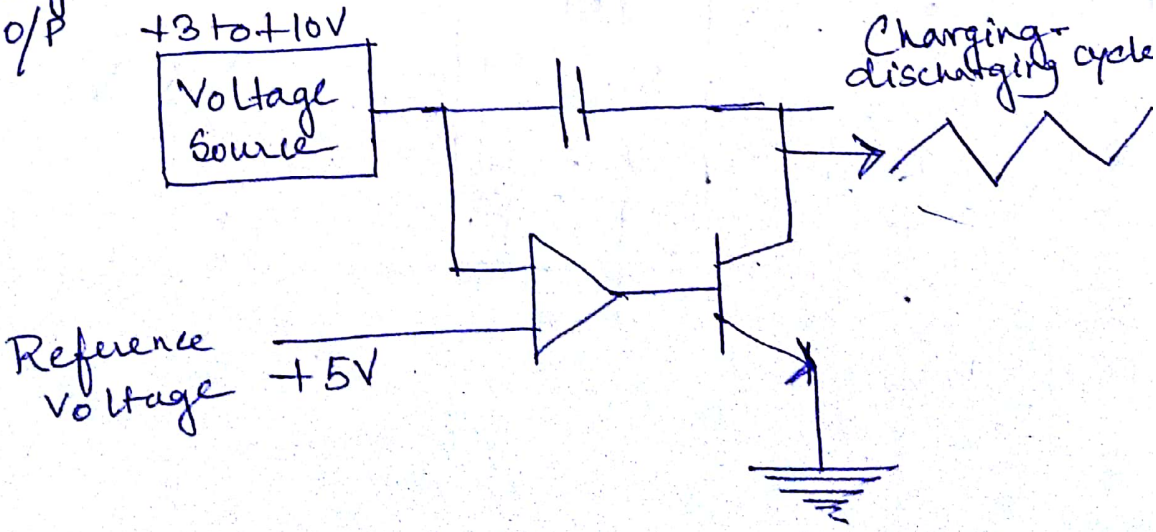
VCO [Voltage Controlled Output]

VCO is of 2 types:

→ Harmonic

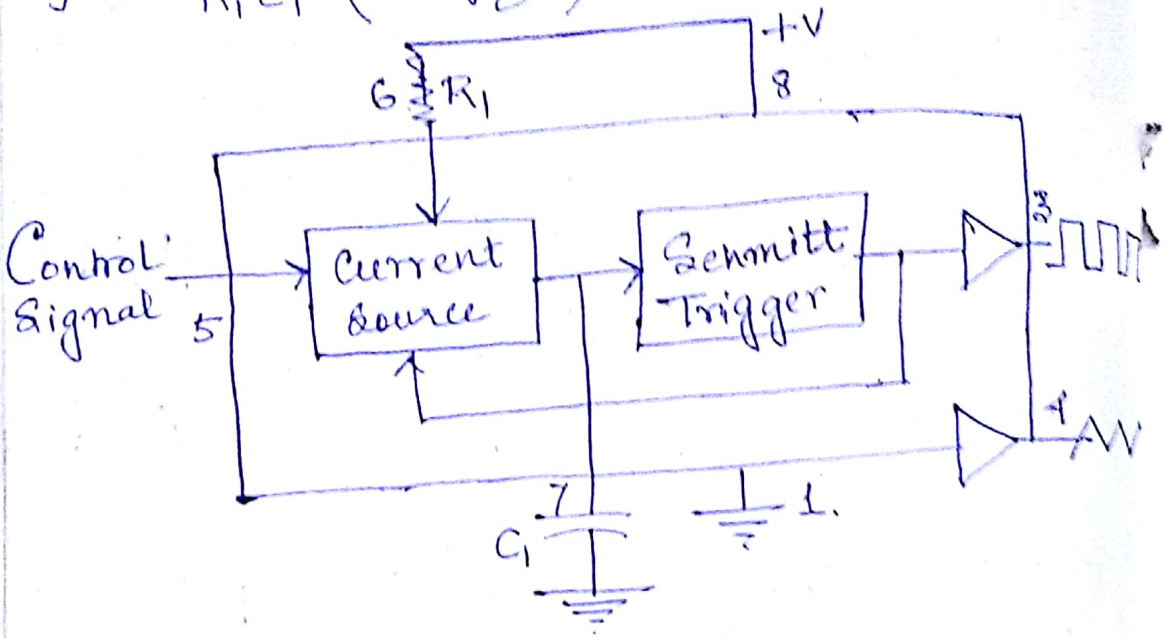
→ Relaxation





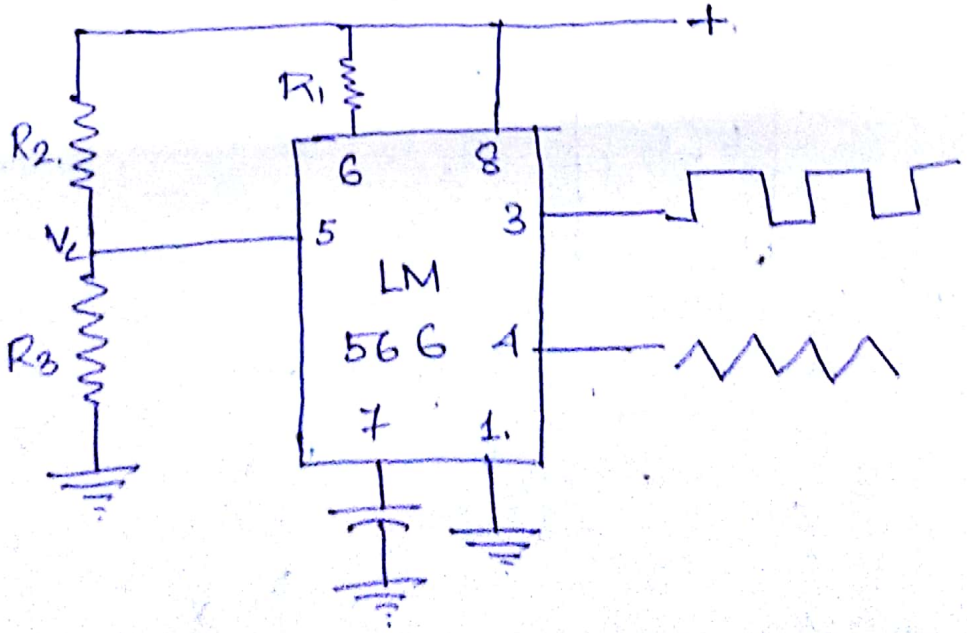
Free running frequency:

$$f_0 = \frac{2}{R_1 C_1}\left(\frac{V_c - V_{in}}{V_c}\right)$$



Given, $R_1 = 10K\Omega$, $C_1 = 820pF$, $R_3 = 10K\Omega$, $R_2 = 1.5K\Omega$

Find V_c :- $V_c = \frac{R_3}{R_2 + R_3} V^+$. $V^+ \rightarrow 12V$.



$$V_e = \frac{10\times10^3}{10^3(1.5+10)} \times V^+ = \frac{10}{11.5} \times V^+ =$$

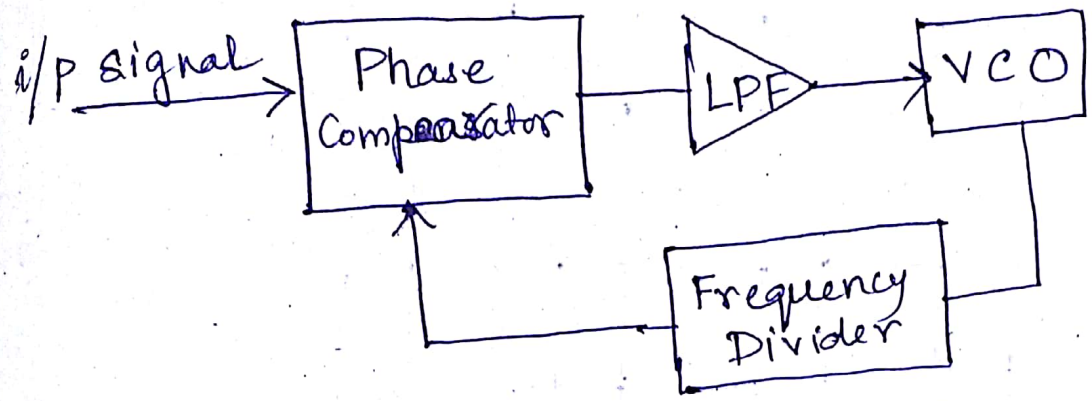
$$\frac{10}{11.5} \times 12 = \frac{120}{11.5}.$$

$$f_o = \frac{2}{10\times8250\times10^{-12}}\left(\frac{120/11.5 - V_{in}}{120/11.5}\right)$$

=

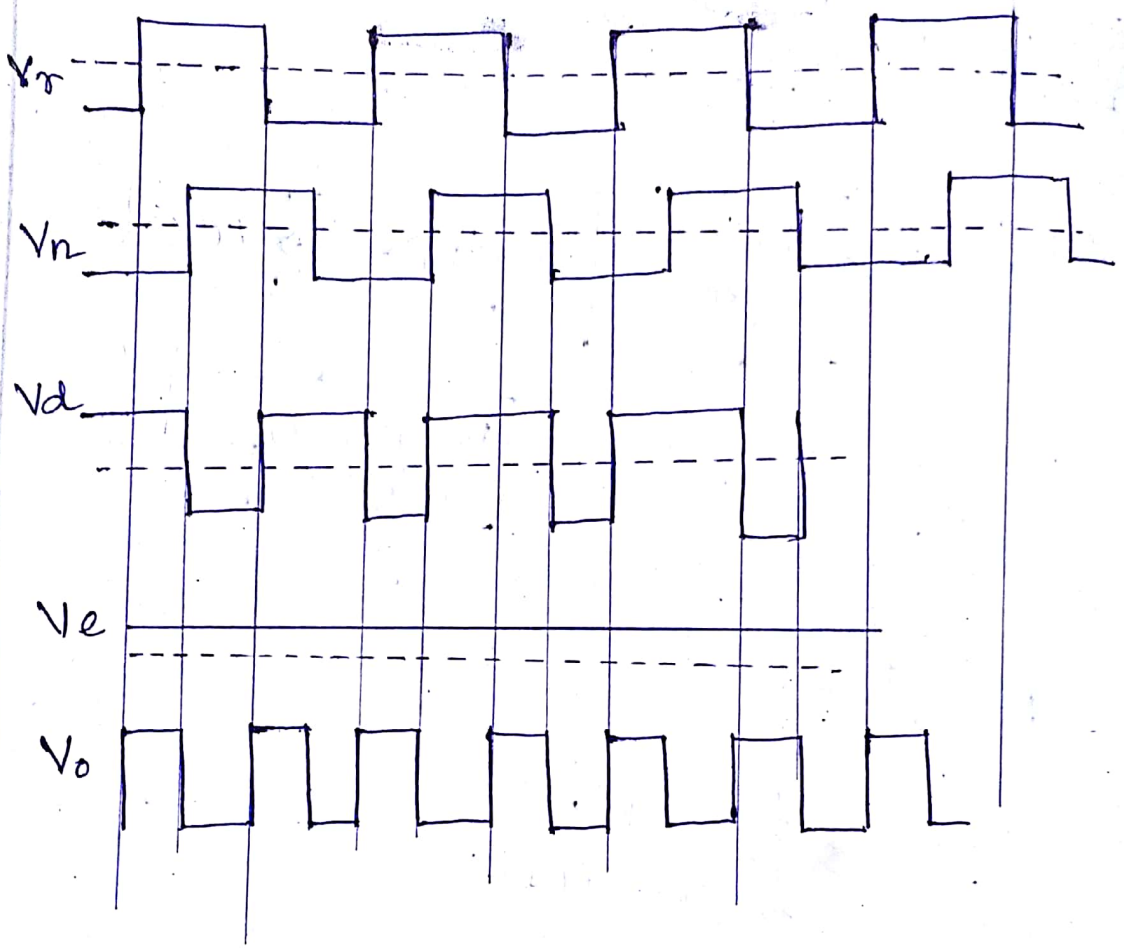
Phase Lock(ed) Loop (PLL):

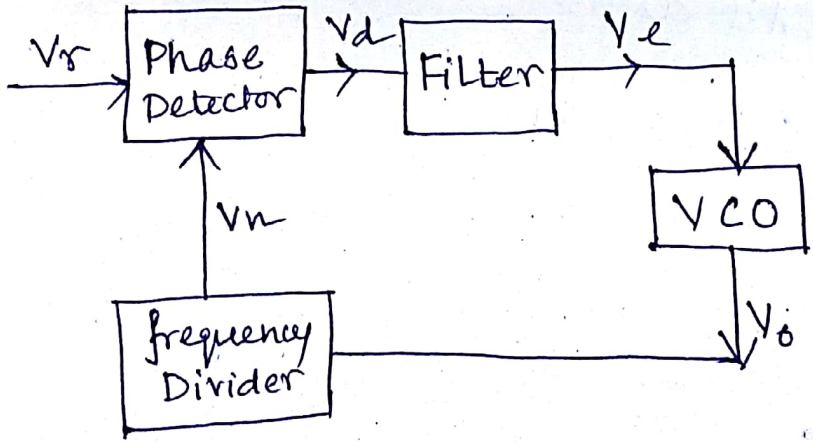
IC → NE 565



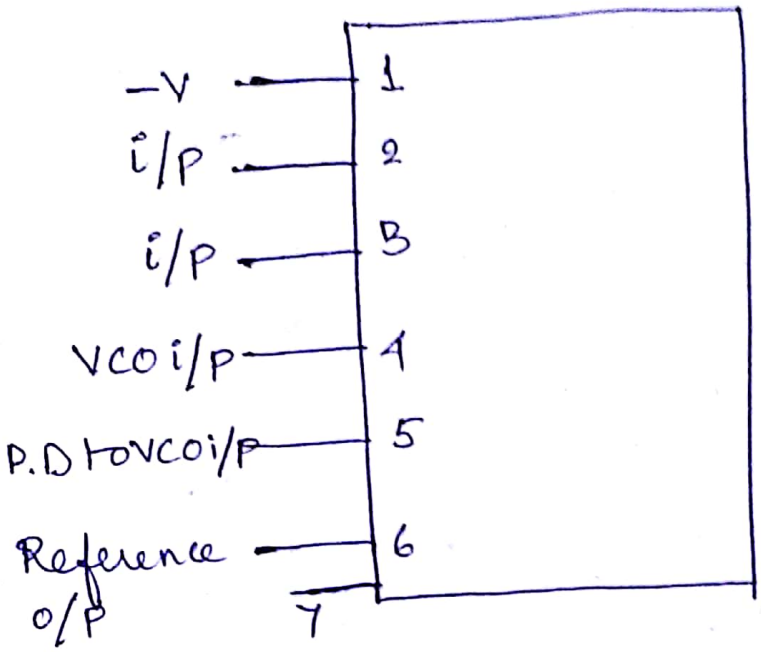
Types of PLL:

1. APLL — Analog PLL
2. DPLL — Digital PLL
3. ADPLL — All digital PLL
4. SPLL — Software PLL



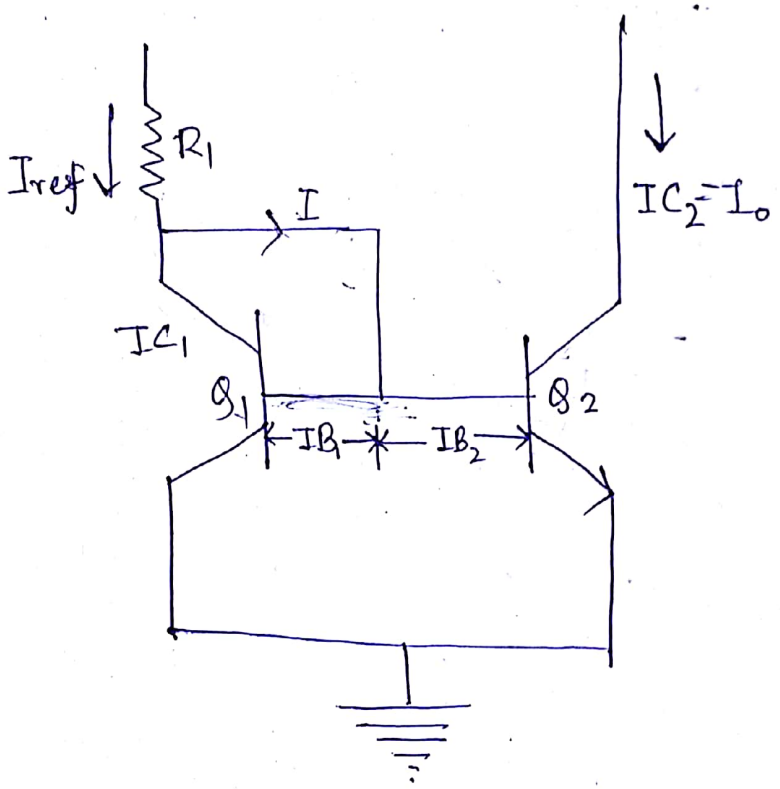


Pin Diagram of NE-565 :



Current Mirror:

The input current will be reflected at the output point/pole.



$IC_1 = IC_2 = IC$

$IB_1 = IB_2 = IB$

$$\boxed{IC = \beta I_B}$$

$$I_{ref} = IC_1 + I$$

$$= IC_1 + I B_1 + IB_2$$

$$= IC_1 + \frac{IC_1}{\beta} + \frac{IC_1}{\beta}$$

$$= IC_1 \left(\frac{\beta + 2}{\beta} \right) \quad \beta >> 2.$$

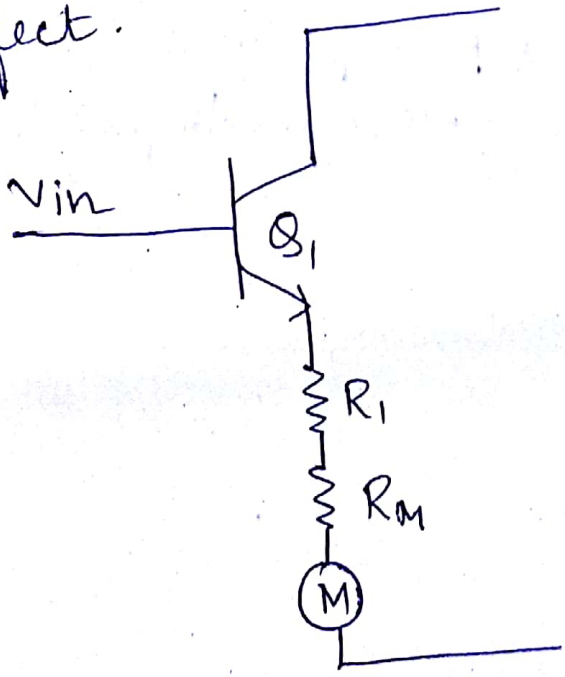
$I_{ref} = I_{C_1} = I_C$

Since $I_{ref} = I_C$,
the output current is a reflection of the input current.

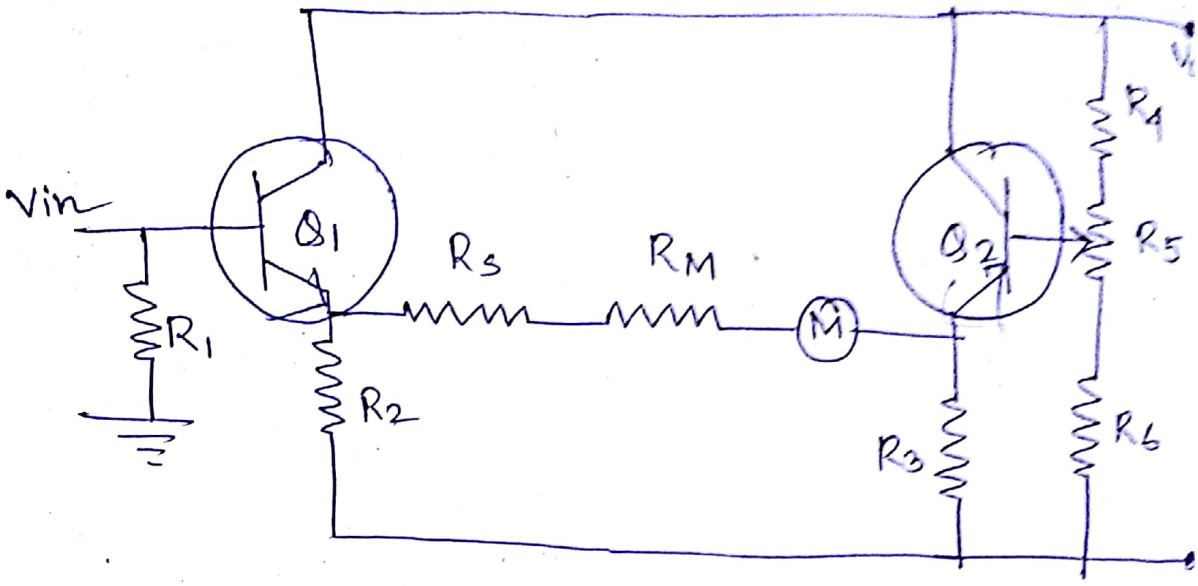
I_c
$+ I_B$
I_c
I_C

Emitter Follower Voltmeter:

Emitter Follower Voltmeter is used to measure low voltage. It reduces loading effect.



Circuit Diagram:

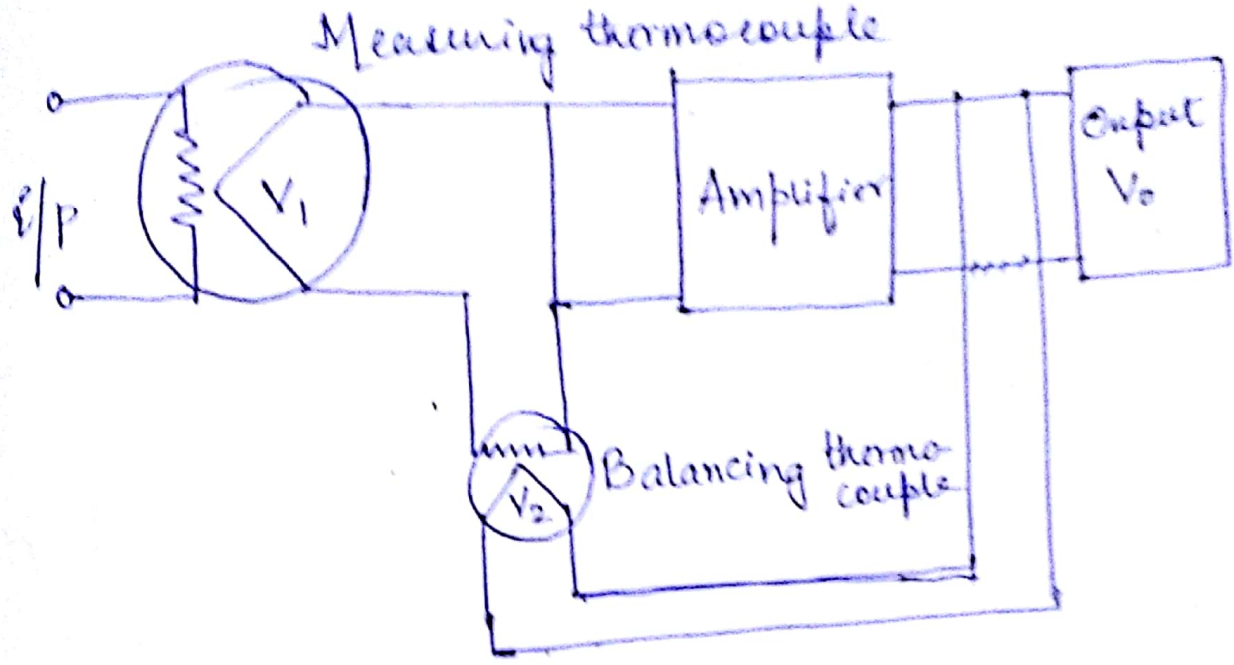


Assignment 1: (22.2.19):

(1.) Write down the working principle with suitable diagram of Programmable Gain Amplifier (PGA) (5)

(2.) (*)

True r.m.s voltmeter :-

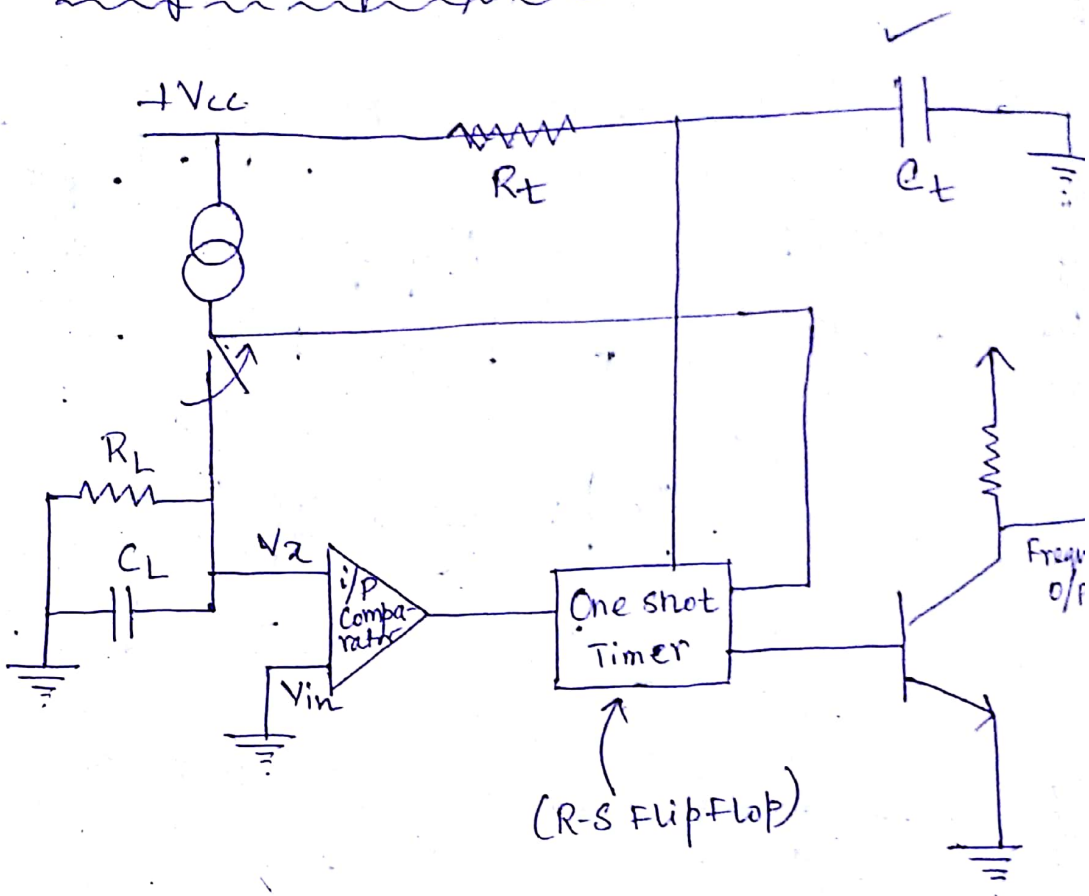


(*) An emitter follower voltmeter circuit has $R_2 = R_3 = 3.9\ k\Omega$ and $V_{cc} = +12V$

a) determine I_2 and I_3 when $E = 0V$

b) Calculate the meter circuit voltage when $E = 1V$ and when $E = 0.5V$.

Voltage to Frequency Converter:



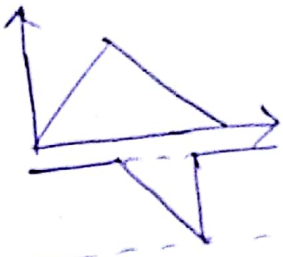
C_t is the timing capacitor.

Voltmeter:

Digital Voltmeter:

Types of digital voltmeter:

(i) Ramp type



(ii) Potentiometric type

(iii) Integrating type

(iv) Successive Approximation type

(v) Dual Slope type

Ramp Type DVM: