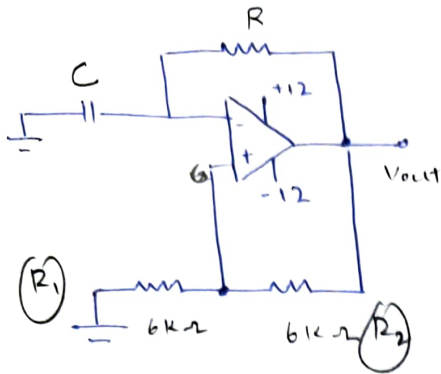


EWI-2 PROJECT -2

① Relaxation oscillator



Assume At $t=0$, $V_C = 0V$, $V_{out} = 12V$.

① $V_C = 12(1 - e^{-t/\tau}) = 0$

② when $V_C > 6 \Rightarrow V_{out} = -12$

③ Cap discharges.

$$\begin{aligned} \Rightarrow V_C &= V_{in(t)} + (V_f - V_{in(t)})e^{-t/\tau} \\ &= 6 + (-12 - 6)(1 - e^{-t/\tau}) \\ &= 18e^{-t/\tau} - 12V \end{aligned}$$

④ when $V_C < -6V \Rightarrow V_{out} = 12V$
 $V_+ = 6V$

We want V_t to be small $\approx 1V$

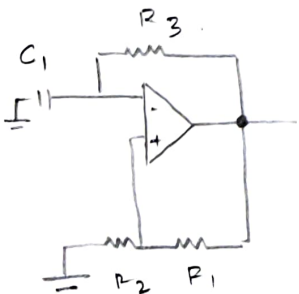
So we can get a triangular wave at capacitor.

(exponent \approx Triangle) $\Rightarrow R_1 = 10k\Omega, R_2 = 100k\Omega$

$$f = \frac{12V}{4 + R_1 \cdot C \cdot (R_3 + R_4)}$$

$R = POT \ 1$

 \rightarrow Freq Selector.



$$\beta = \frac{R_2}{R_1 + R_2}$$

$$f = \frac{1}{2 \cdot C_1 \cdot R_3 \cdot \ln\left(\frac{1+\beta}{1-\beta}\right)}$$

$R_3 \uparrow \Rightarrow f \downarrow$ $R_3 \downarrow \Rightarrow f \uparrow$
(or) C_1 (or) C_1

$\Rightarrow R_3 = POT (100k)$

$C_1 = 1\mu$ initially

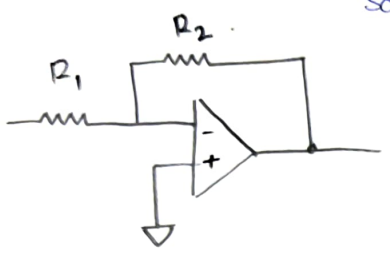
Lower \Rightarrow High \uparrow freq.

The o/p of Prev stage is Sq wave with -10 to +10.

* But this is not necessary as of now.

we need this at Amp Scaling. Just

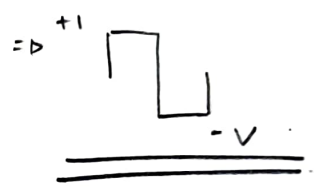
IC1B → Inverting Amplifier to attenuate the Sq. wave.



$$G = \frac{-R_2}{R_1 + R_2}$$

$R_2 = 1k$
 $R_1 = 10k$

$\Rightarrow G \approx -0.1$



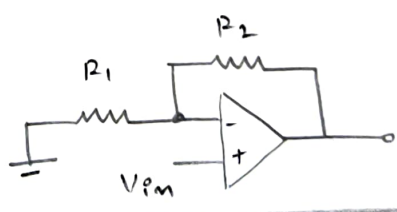
(Now we can scale this).

IC1C → Non-inverting Amp that picks up the M wave.

Why Non inverting? \Rightarrow Very high i/p Impedance

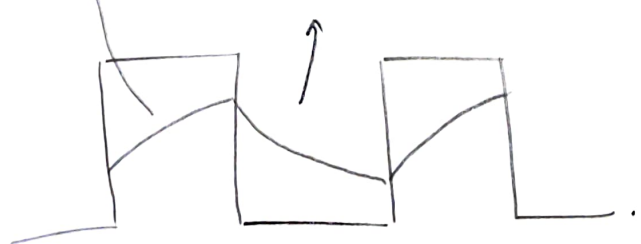
charge on cap is very small Any significant current drawn can Ruin the oscillator.

$$G = 1 + \frac{R_2}{R_1}$$

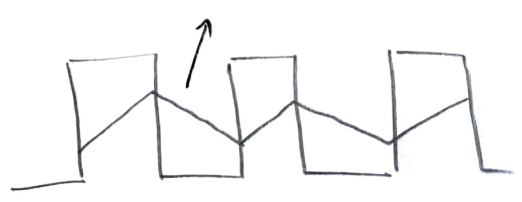


$V = V_0(1 - e^{-t/\tau})$

High threshold for Relaxation oscillator



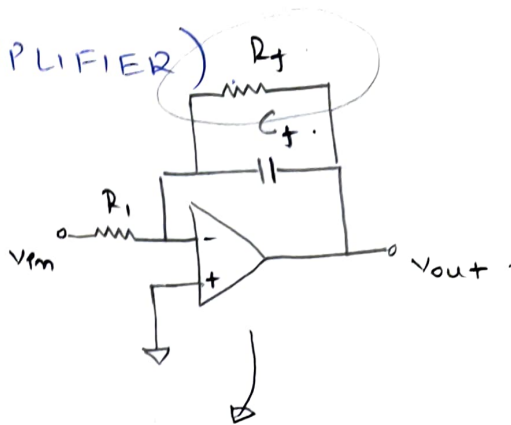
Low threshold (Triangular wave)



IC 2A (INTEGRATING AMPLIFIER)

$$G = - \frac{1}{2\pi R C f}$$

frequency dependent.



only at high freq Producing

Sine wave.

* To Make this work

we Adjusted the Capacitance to 0.5 μ

at the IC 1A. Also as the frequency changes

we can Adjust the 'C' in this Integrating Amplifier.

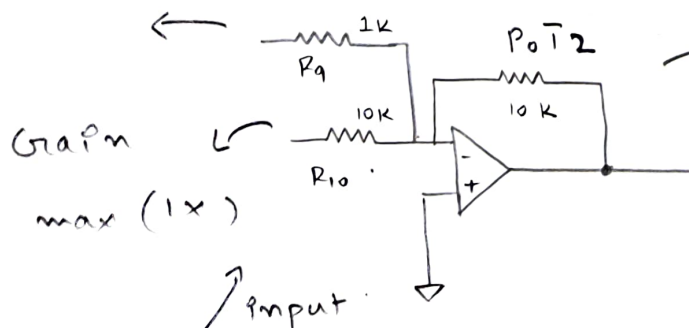
"IC 2B" is just an Inverting Amplifier used to Calibrate the Sine Wave.

IC 2C is another Inverting Amplifier. Gain is either $G = -POT2/R_9$ (or) $G = -POT2/R_{10}$.

we can use a Switch here.

Gain :- 1x (or) 10x

Gain (10x)



voltage can be controlled from

10mV to 10V

* At last power transistor Push Pull Amplifier is Added to restore the signal to its original value.