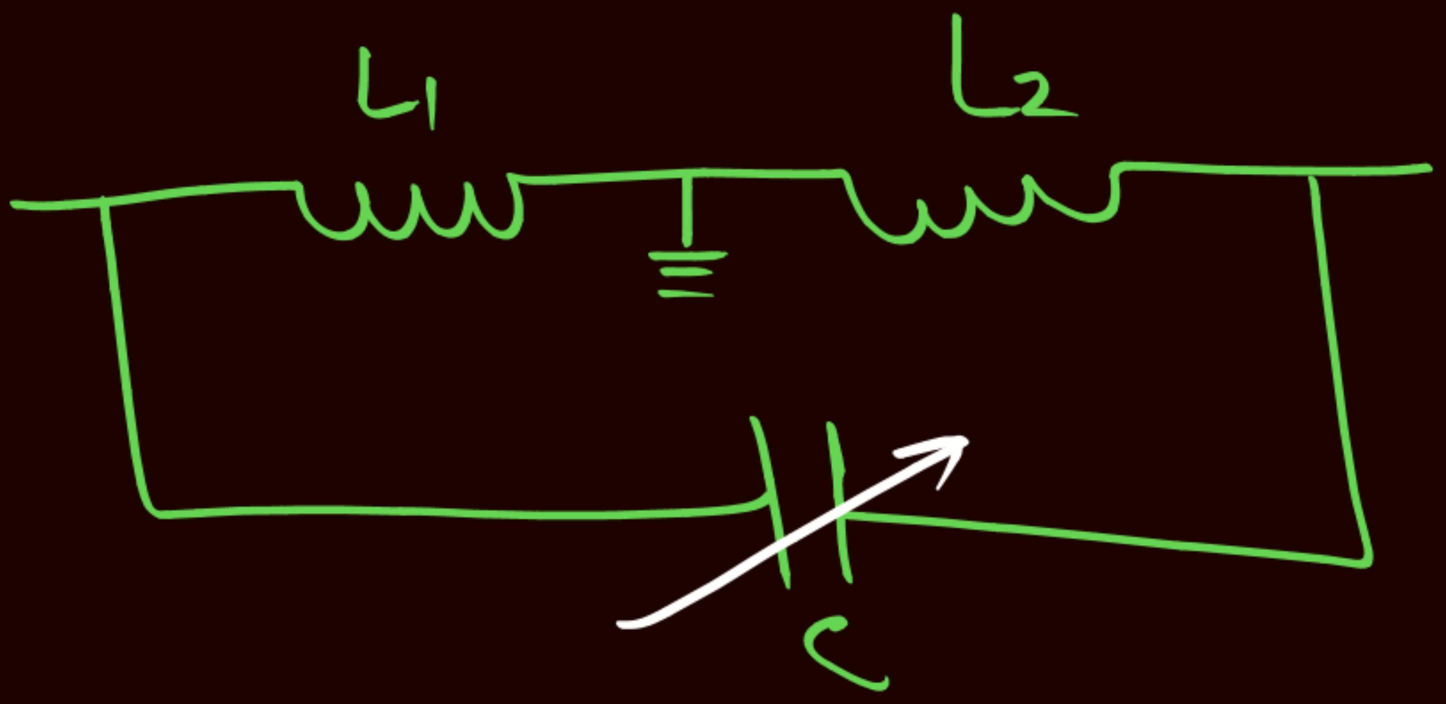
Hartley Oscillator:

$$\omega_0 = \frac{1}{\sqrt{(L_1+L_2)C}} \rightarrow \text{freq of Osc.}$$



Also called taped inductor Oscillator

Working Principle is parallel Resonance

Advantage:

Capacitor is used for tuning

Disadvantage:

circuit is bulky & Expansive due to inductor is used.

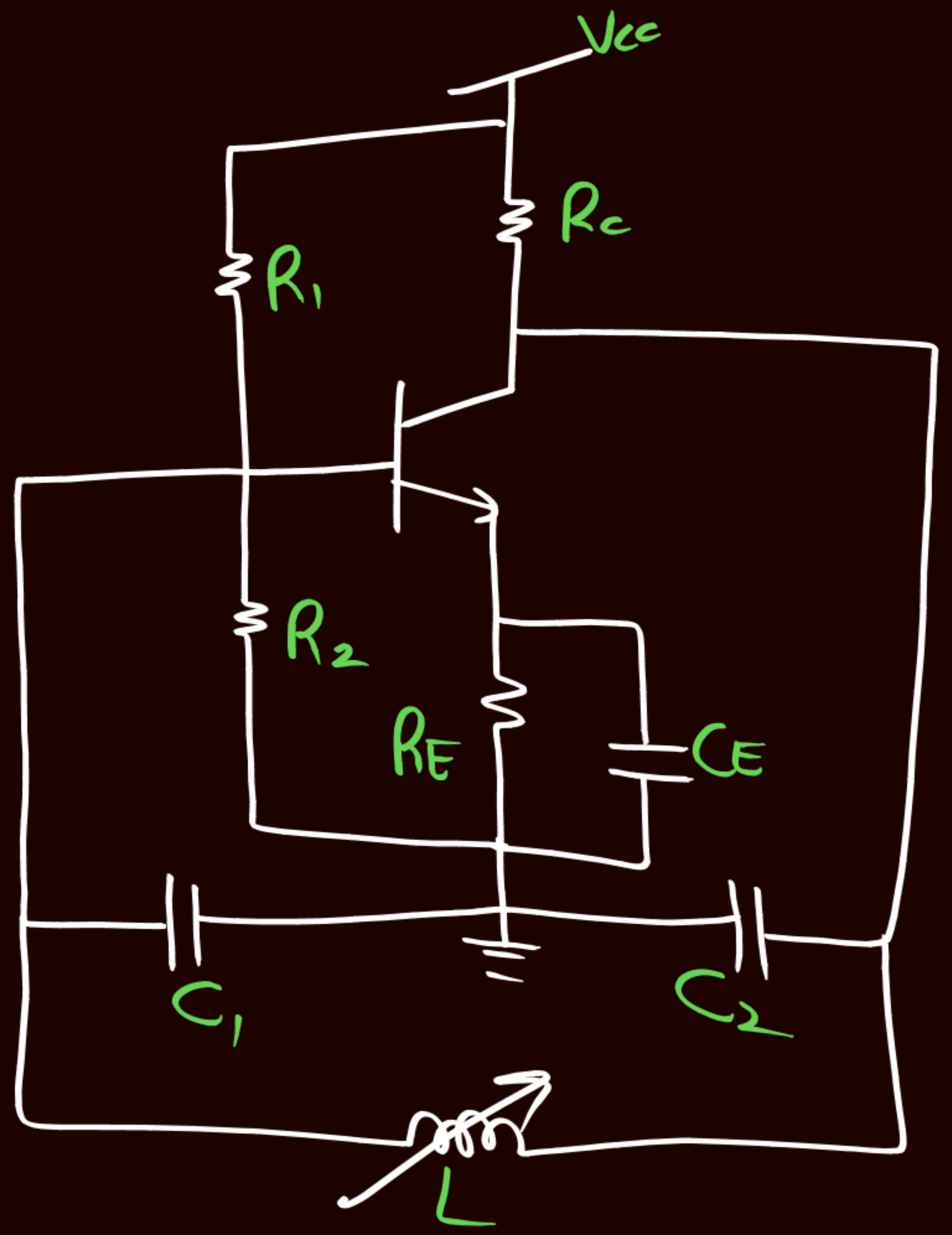
→ used as Local Oscillator at receivers.

Colpitt Osc. :

$$Z_1 + Z_2 + Z_3 = 0$$

$$X_1 + X_2 + X_3 = 0$$

$$\frac{-1}{\omega_0 C_1} - \frac{1}{\omega_0 C_2} + \omega_0 L = 0$$



$$\omega_0 L = \frac{1}{\omega_0 C_1} + \frac{1}{\omega_0 C_2}$$

$$\omega_0 L = \frac{1}{\omega_0}\left[\frac{1}{C_1} + \frac{1}{C_2}\right]$$

$$\omega_0^2 = \frac{1}{L}\left[\frac{C_1 + C_2}{C_1 C_2}\right]$$

$$\boxed{\omega_0 = \sqrt{\frac{1}{L}\left(\frac{C_1 + C_2}{C_1 C_2}\right)}}$$

$$\omega_0 = \frac{1}{\sqrt{L \cdot \left(\frac{C_1 C_2}{C_1 + C_2}\right)}}$$

$$\omega_0 = \frac{1}{\sqrt{L \cdot C_T}}$$

$$C_T = \frac{C_1 C_2}{C_1 + C_2}$$

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2}$$

→ Working Principle is Parallel Resonance.

Advantage:

→ It is Smaller in Size and economical

→ Better freq Stablity.

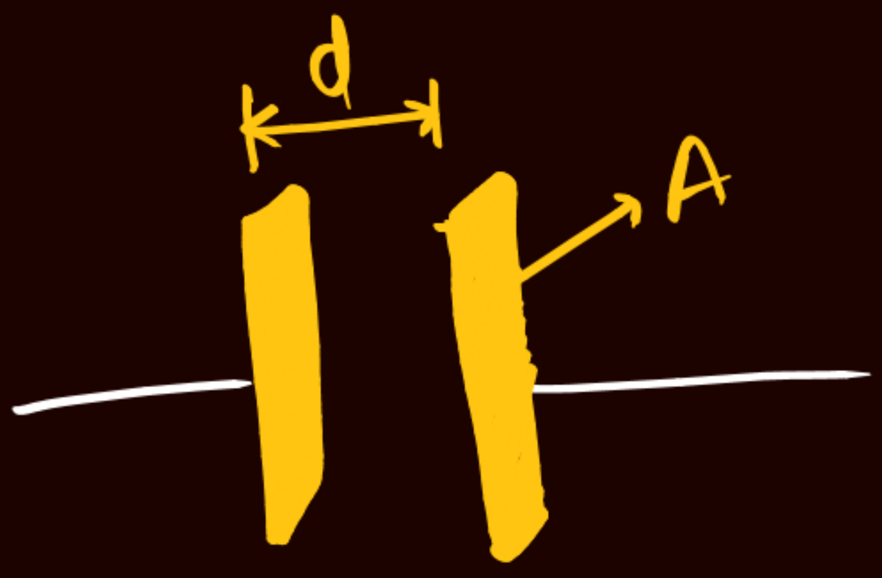
Disadvantage :

→ Inductive tuning.

$$W_0 = \frac{1}{\sqrt{L\left(\frac{C_1C_2}{C_1+C_2}\right)}}$$

Application:

Used as Local Oscillator at receiver.

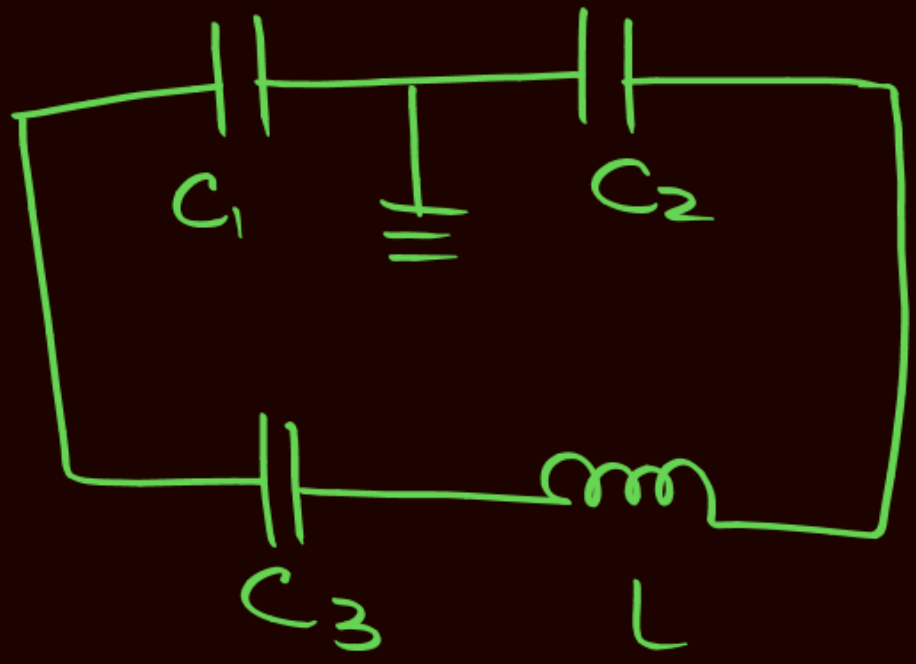


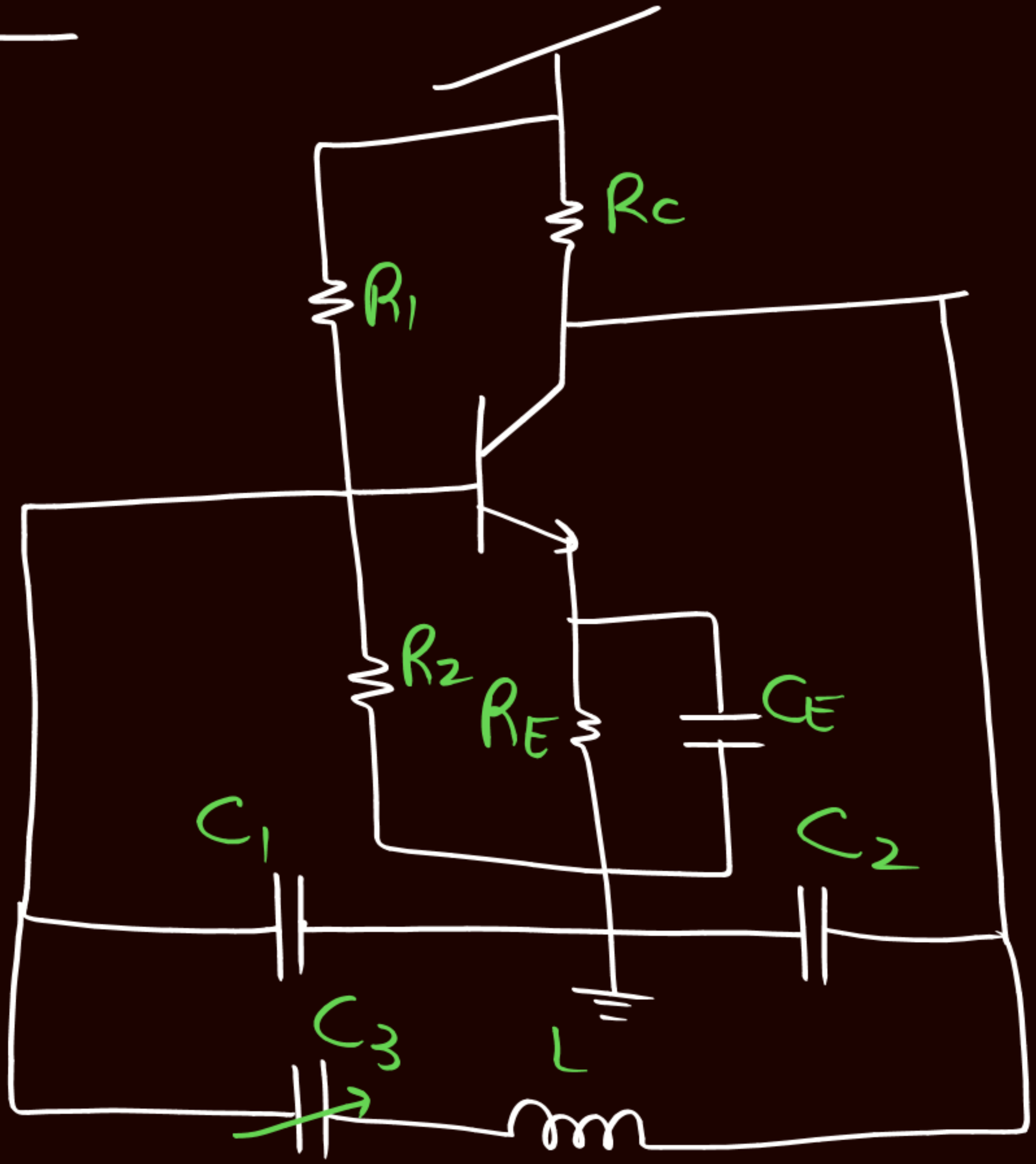
$$C = \frac{\varepsilon A}{d}$$

d ↑es C ↓es

d ↓es C ↑es

Clapp Oscillator :





$$X_1 + X_2 + X_3 + X_4 = 0$$

$$-\frac{1}{\omega_0 C_1} - \frac{1}{\omega_0 C_2} - \frac{1}{\omega_0 C_3} + \omega_0 L = 0$$

$$\omega_0 L = \frac{1}{\omega_0}\left[\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}\right]$$

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$$

$$\omega_0 L = \frac{1}{\omega_0} \frac{1}{C_T}$$

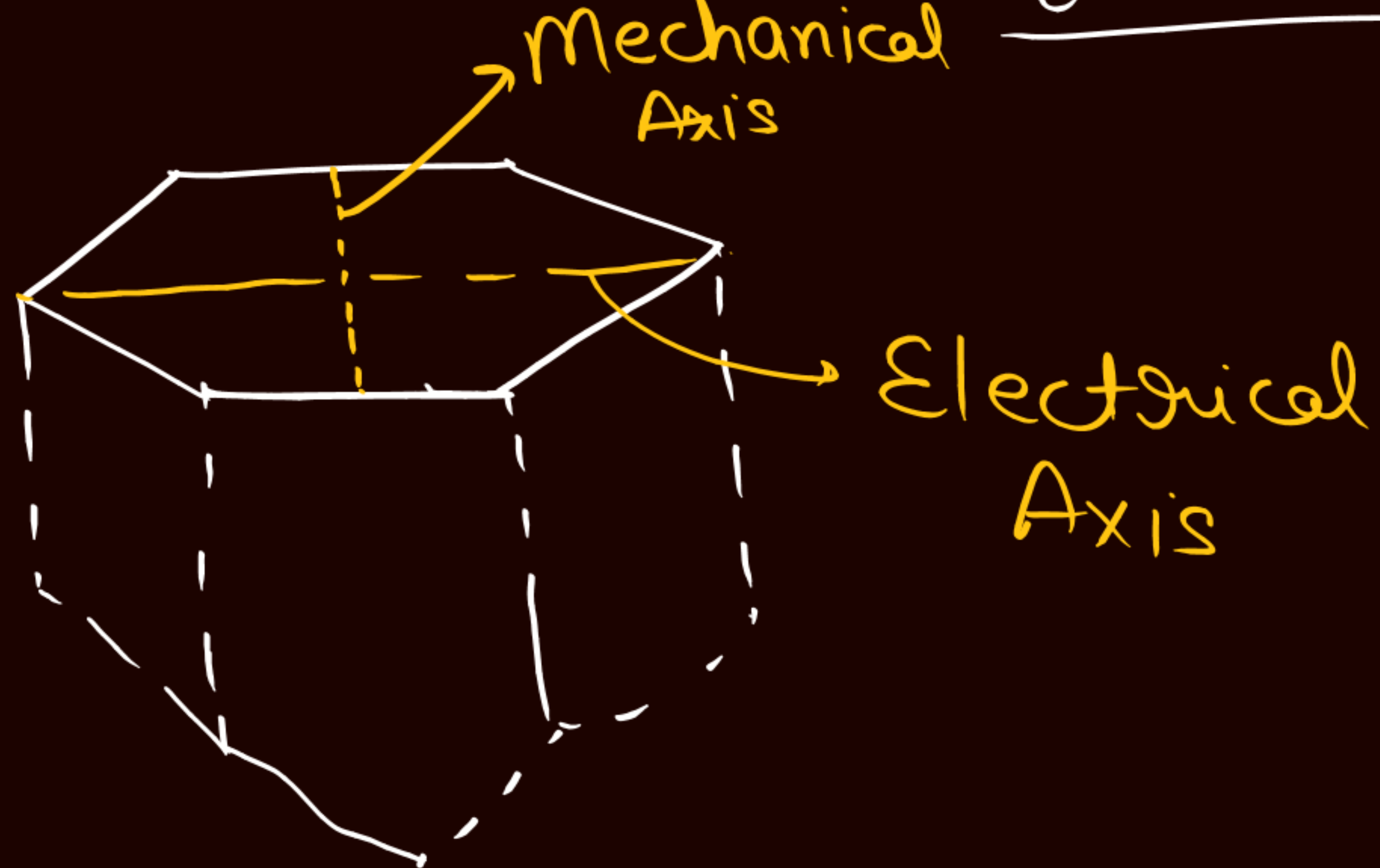
$$\omega_0 = \frac{1}{\sqrt{L \cdot C_T}}$$

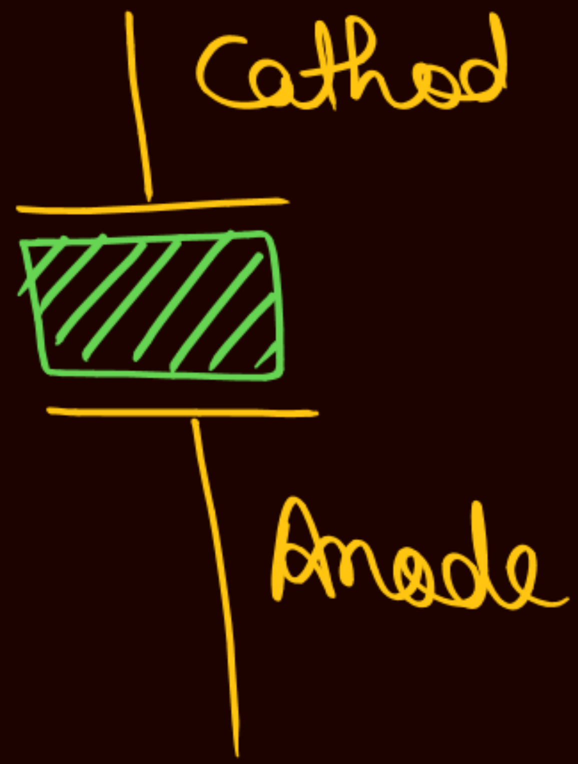
Working Principle

→ Series Resonance

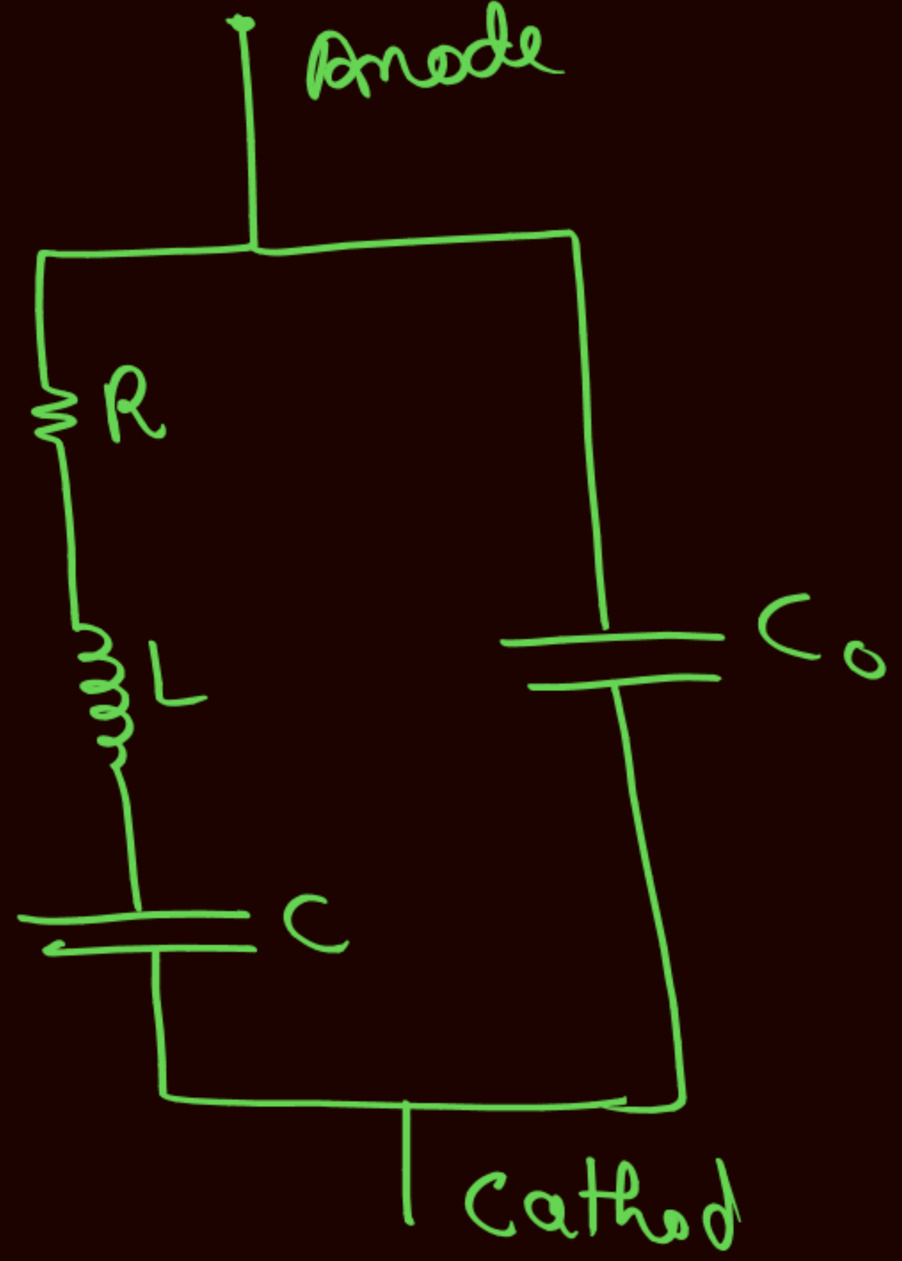
Crystal Oscillator:

Quartz crystal





Equivalent circuit:



R = Viscous Damping (circuit internal loses)

L = mass of crystal

C = Stiffness = $\frac{1}{\text{Spring constant}}$

C_0 = Capacitance b/w anode and Cathod

Series Resonance

$$\omega_s = \frac{1}{\sqrt{LC}}$$

Parallel Resonance

$$\omega_0 = \frac{1}{\sqrt{L \cdot C_{eq}}}$$

$$C_{eq} = \frac{C \cdot C_0}{C + C_0}$$

Advantage:

→ Excellent freq Stability

→ Simplest RF Oscillator.

Disadvantage:

fixed freq type Osc.

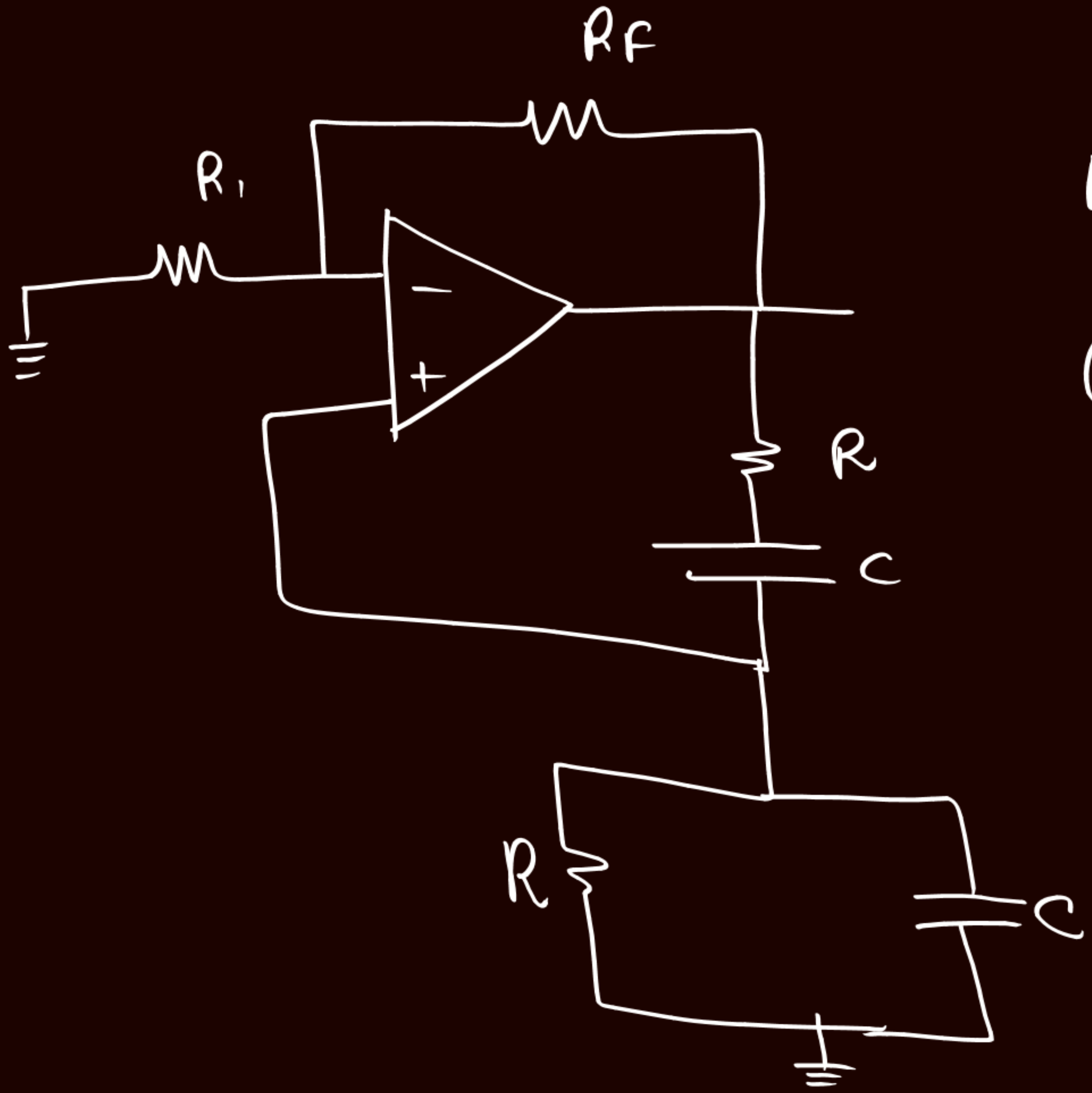
Used as

→ to generat carrier signal in AM and FM transmission.

→ Designing of timer circuit.

Sinusoidal Oscillator:

The End



Name = Wein-Bridge Osc

Oscillation freq

$$\omega_0 = \frac{1}{RC}$$

<u>Condition of Osc:</u>

$$R_F = 2R_1$$