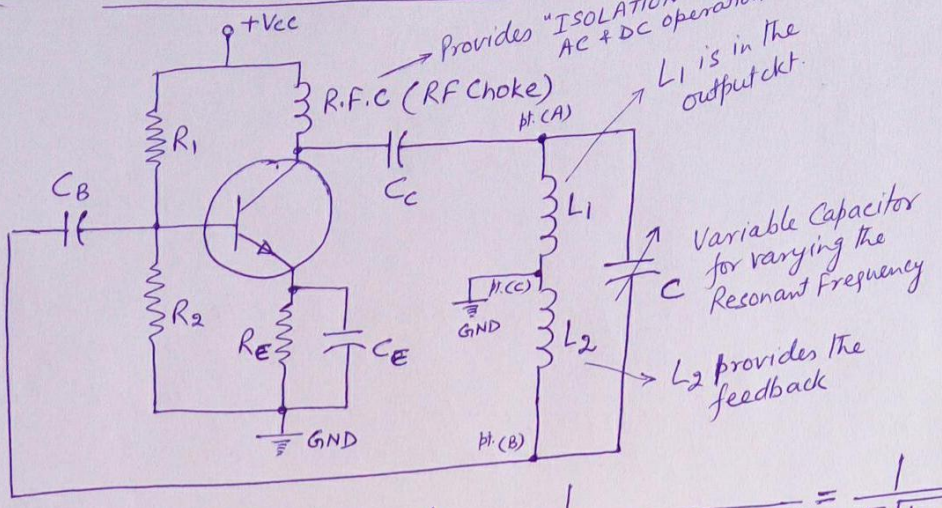
(Series-Fed) HARTLEY OSCILLATOR



$\Rightarrow$ Resonant Frequency $f_R = \frac{1}{2\pi\sqrt{(L_1+L_2+2M)C}} = \frac{1}{2\pi\sqrt{L_{equ.}C}}$

($L_{equivalent} = L_1+L_2+2M$)
↳ If Two Separate Coils are used in Tank Ckt.

$\approx \frac{1}{2\pi\sqrt{(L_1+L_2)C}}$ [ignoring Mutual Inductance]

$\Rightarrow$ Feedback Fraction, $\boxed{B = \frac{L_2}{L_1}}$

(∵ output voltage appears across L_1 & Feedback voltage appears across L_2)

$\Rightarrow$ For Oscillations to start i.e Condition for Sustained Oscillations, Voltage Gain (A_V) must be greater than $\frac{1}{B}$

i.e $A_V > \frac{1}{B}$

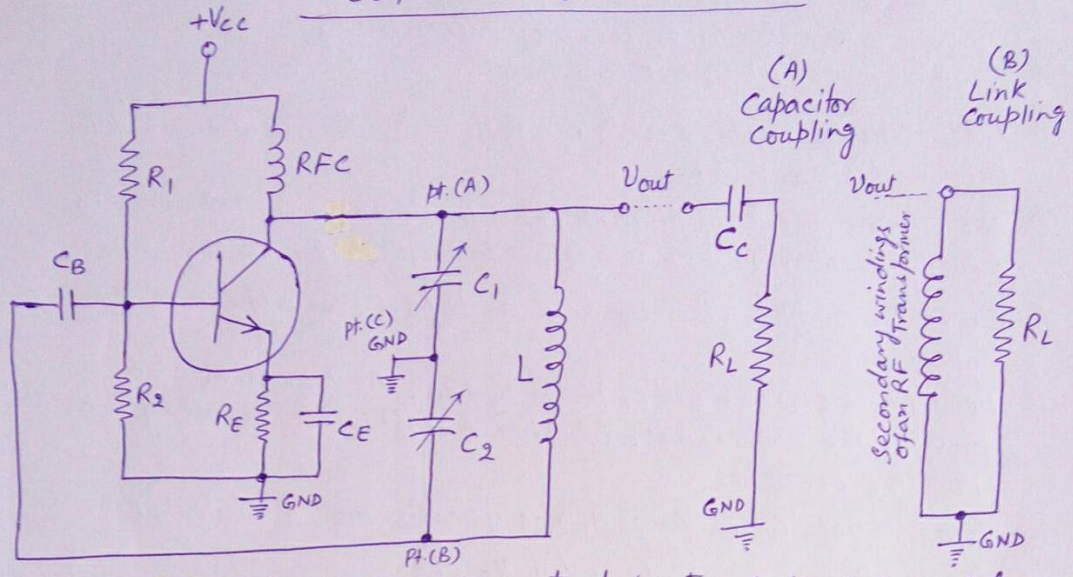
or $\boxed{(A_V)_{min} = \frac{1}{B} = \frac{L_1}{L_2}}$

$\Rightarrow$ Often, Hartley Oscillator uses a "Single Tapped Inductor" instead of two separate inductors

$\Rightarrow$ Capacitors C_B & C_C block d.c. & allow a.c. to pass through.

$\Rightarrow$ RFC (Radio Frequency Choke) offers Very High Impedance to High Frequency signals i.e for d.c it is a short circuit but for a.c its an Open ckt. Therefore, RFC provides dc load for Collector & does not allow a.c signal/currents to backflow into DC supply Source (+Vcc).

COLPITTS OSCILLATOR



- Two types of Couplings to take the output signal from ckt. (Used if the Load Resistance R_L is small)

⇒ Resonant Frequency $\boxed{f_R = \frac{1}{2\pi\sqrt{LC_T}}}$

where $C_T = \frac{C_1 C_2}{C_1 + C_2}$ (C_1 & C_2 are connected in "Series")

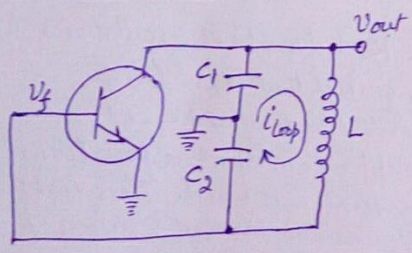
⇒ Feedback fraction, $\boxed{B = \frac{C_1}{C_2}}$ ∵ output volt. (V_{out}) appears across C_1 & feedback volt. (V_f) appears across C_2.

⇒ For Sustained Oscillations $\boxed{(A_v)_{min} = \frac{1}{B} = \frac{C_2}{C_1}}$

Initially for Oscillations to start $A_v > \frac{1}{B}$.

⇒ RF Choke has the same function as in Hartley Oscillator - provides Isolation between ac & dc operation of ckt.

EQUIVALENT Ckt of Colpitts Oscillator:



- Circulating/loop current in Tank ckt flows thro' C_1 in series with C_2.

V_{out} = AC Volt. across C_1

V_f = Feedback volt. across C_2

- V_f drives the Base of CE Config. & sustains the oscillations developed in Tank ckt.
- Initially A_v must be slightly more than $\frac{1}{B}$.