Image

ASSIGNMENT

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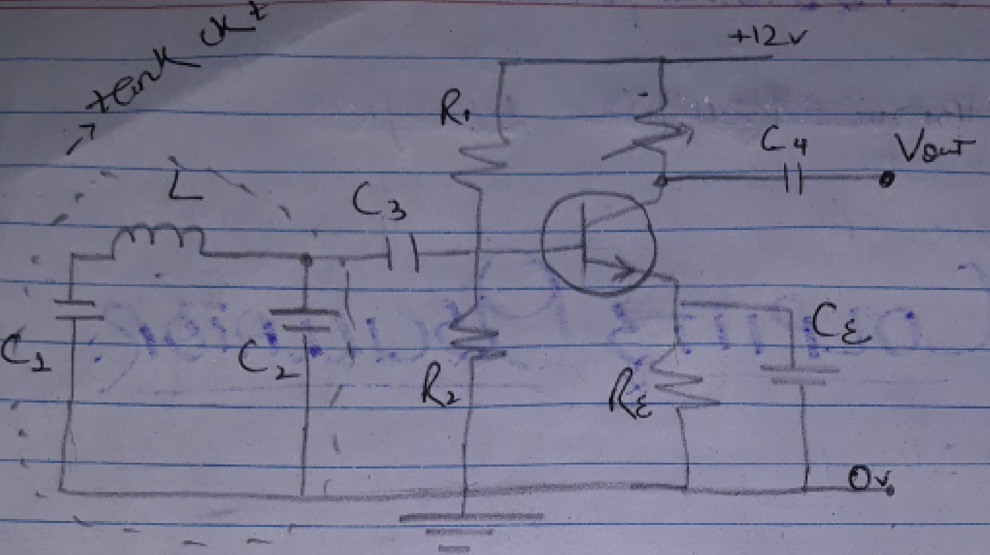
COLPITTS OSCILLATOR:

- DESIGN:

The colpitts Oscillator design uses two centre-tapped cappacitor in series with a parallel inductor to form its resonance tank ckt producing sinusoidal oscillations.

In many ways the colpitts oscillator is opposite to Hartley Oscillator. The tank circuits consists of an LC sub-ckt connected with the input (base) & the output (collector) terminals. Thereby producing a sinusoidal output waveform.

- can be made by a transistor or by an op-amp.



CE configuration:

WORKING:

The emitter terminal of the transistor is effectively are connected with the capacitor C_1 & C_2 which are in series & makes a voltage divider arrangement. when the power supply is firstly applied through the capacitor's & charged up & then simply discharge through the coil L. This will produce oscillations in the base & amplified at the collector terminal.

- The frequency of oscillations for a colpitts oscillator is determined by the resonant frequency of the LC tank ckt & is given as-

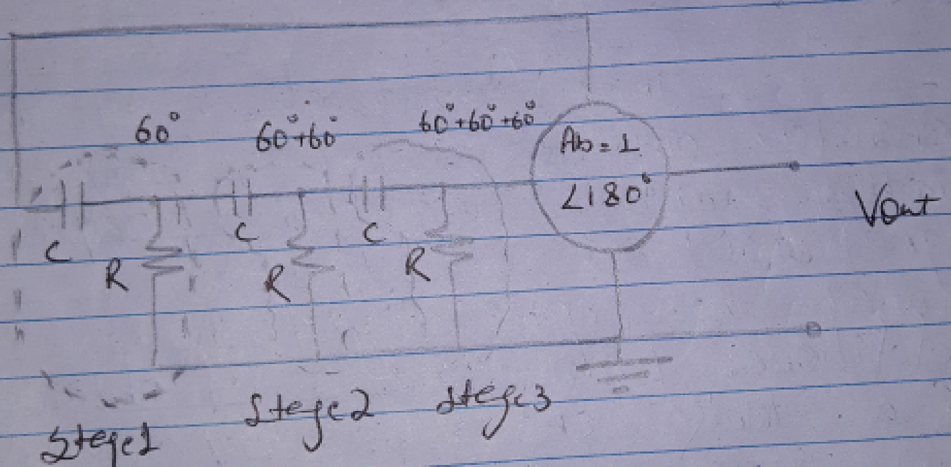
$$f_r = \frac{1}{2\pi\sqrt{LC_T}} \qquad \therefore \frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2}$$

WHY NO PHASE SHIFT:

The configuration of the transistor amplifier is of a Common Emitter Amplifier with the output signal 180° out of phase w.r.t the input signal. The additional 180° phase is obtained by a tank ckt (two capacitors in series & one inductor in parallel). produces overall phase shift of the ckt being zero or 360°

RC OSCILLATOR CIRCUIT:

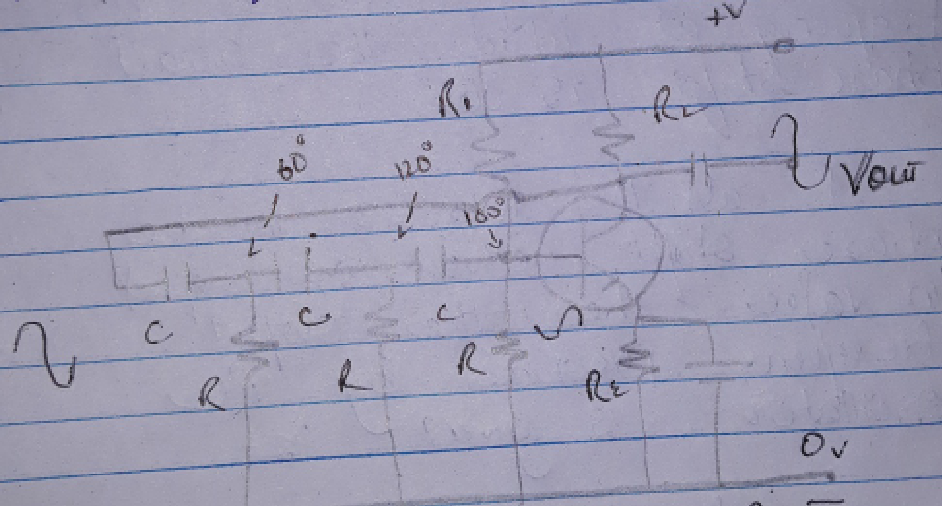
RC oscillators use a combination of an RC network to produce oscillations due to the phase shift between the stages.



The RC network in the first stage produces a phase shift of 90° ideally. But practically less than 90°. In this RC circuit output voltage leads the input by some angle θ. For making a phase shift of 180° for oscillations atleast two single-poles must be used in RC

Oscillator design-

In reality you have to cascade 3 phase RC to attain 180° phase- Then by connecting these RC networks in series a chosen frequency & this forms the basis of "phase shift Oscillator"-



RC Oscillator using BJT

The basic RC Oscillator also known as phase-shift Oscillator produces a sine wave output signal using regenerator feedback obtained from the resistor-capacitor combination-

The resistor-capacitor feedback network can be connected as shown above to produce a leading phase shift or interchanged to produce a lagging phase shift but the outcome is still the same as the sine wave. Oscillations only occur at the frequency at which the overall phase-shift is 360°

If all the R's, C's in the phase shift network are equal in value then the output frequency produced by RC oscillator is given as -

$$f_r = \frac{1}{2\pi RC\sqrt{2N}}$$

N = no of RC stages (3).

• we can also design RC oscillator using an op-amp.