SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

19EET202 / ANALOG ELECTRONICS

II YEAR / III SEMESTER

UNIT-4: FEEDBACK AMPLIFIERS AND OSCILLATORS

COLPITTS OSCILLATOR

What We'll Discuss

TOPIC OUTLINE

Introduction

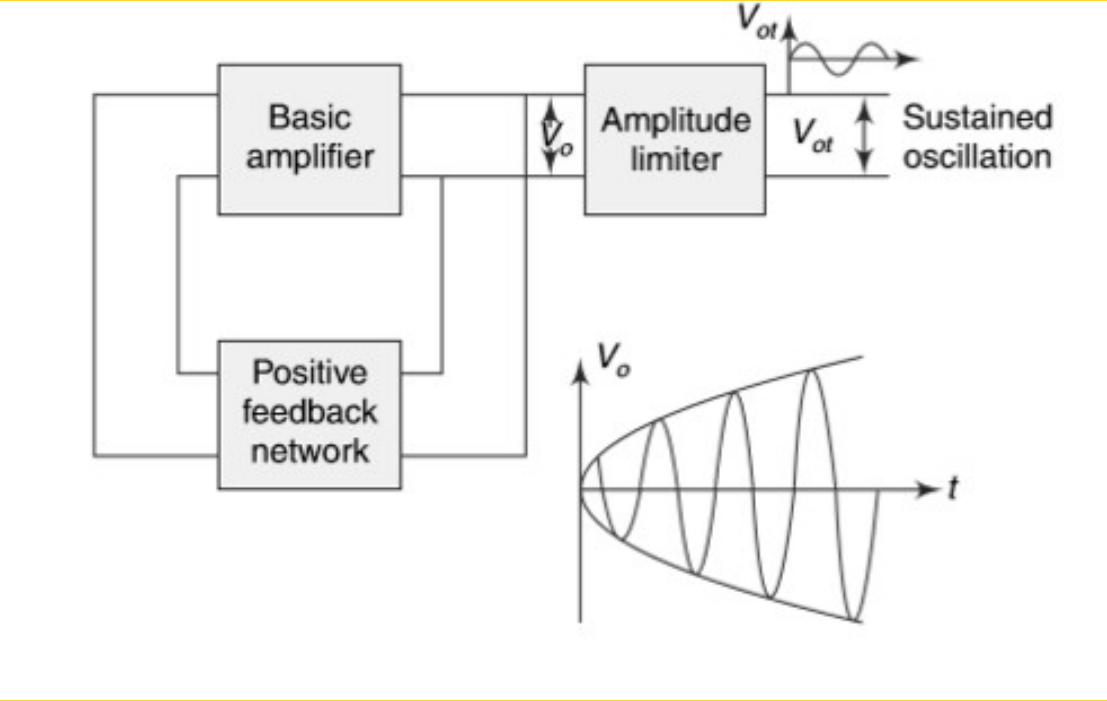
Classification

Working

Applications

Need for Oscillators

- Communication Systems
- Control signal



Colpitts Oscillator Circuit

- NPN transistor
- Conditions for oscillations
- Positive- Feed back

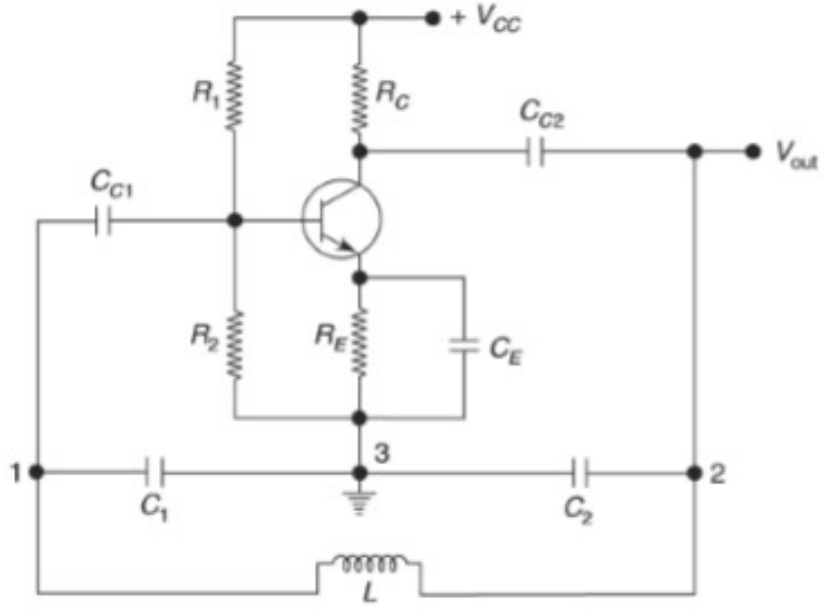


Fig. 15.5 *Colpitts oscillator*

Differential Amplifiers

•The difference-mode input voltage is defined as

$$V_d = (V_1 - V_2)$$

•• The common-mode input voltage is defined as

$$V_{cm} = \frac{(V_1 + V_2)}{2}$$

Mechanism of Start of Oscillation

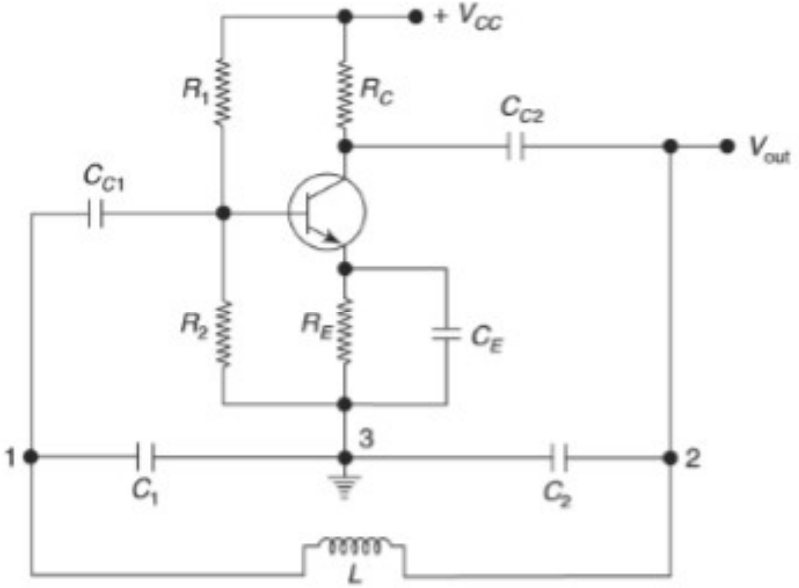
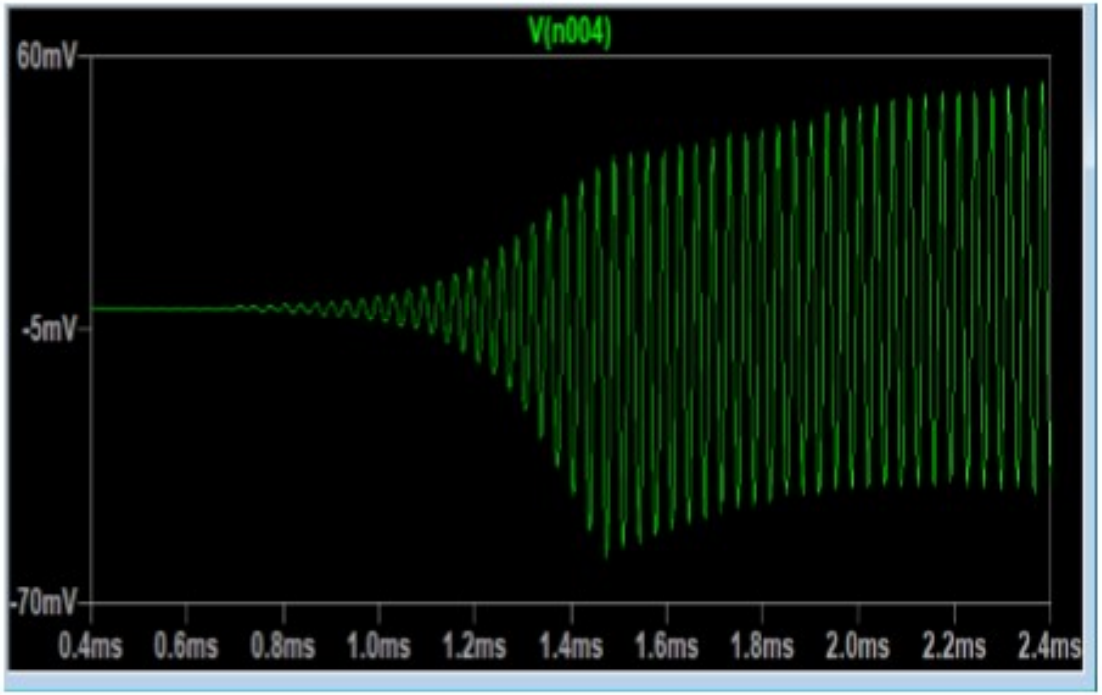


Fig. 15.5 *Colpitts oscillator*

Amplitude Limiting



Frequency of Oscillation

$$Z_1 = \frac{1}{j\omega C_1} = -\frac{j}{\omega C_1}$$

$$Z_2 = \frac{1}{j\omega C_2} = -\frac{j}{\omega C_2}$$

$$Z_3 = j\omega L$$

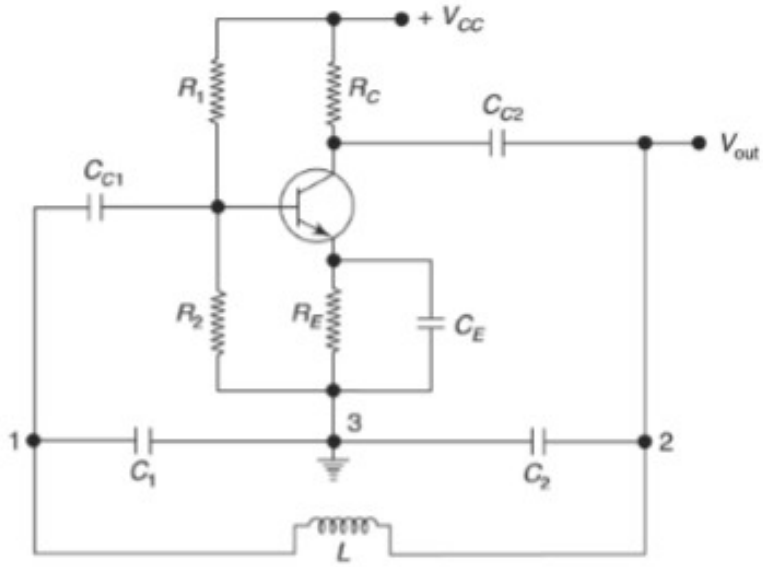


Fig. 15.5 *Colpitts oscillator*

Frequency of Oscillation

General Equation of Oscillation

$$h_{ie}(Z_1 + Z_2 + Z_3) + Z_1Z_2(1 + h_{fe}) + Z_1Z_3 = 0$$

$$-jh_{ie}\left(\frac{1}{\omega C_1} + \frac{1}{\omega C_2} - \omega L\right) + \left(\frac{1 + h_{fe}}{\omega^2 C_1 C_2} - \frac{L}{C_1}\right) = 0$$

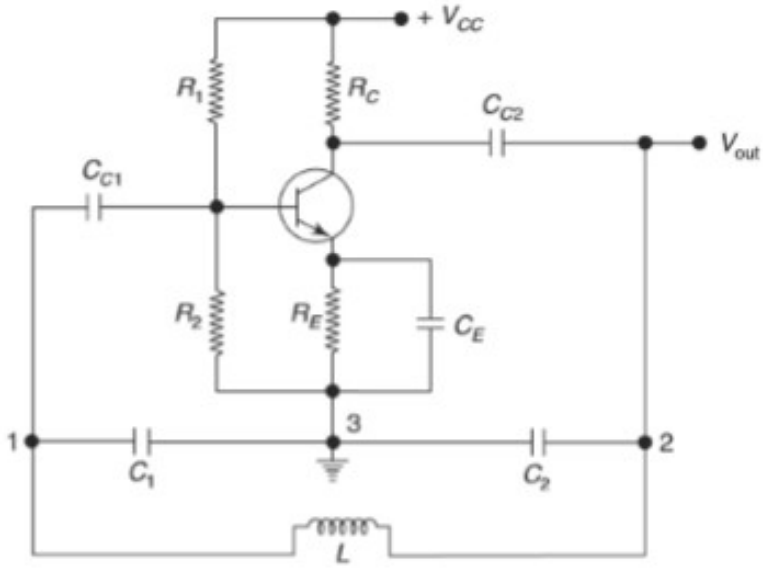


Fig. 15.5 *Colpitts oscillator*

Fréquency of Oscillation

- For calculating the frequency of oscillation
- Equate the imaginary part of the basic equation to zero

$$f_o = \frac{\omega_o}{2\pi}$$

$$f_o = \frac{\omega_o}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{C_1 + C_2}{LC_1C_2}}$$

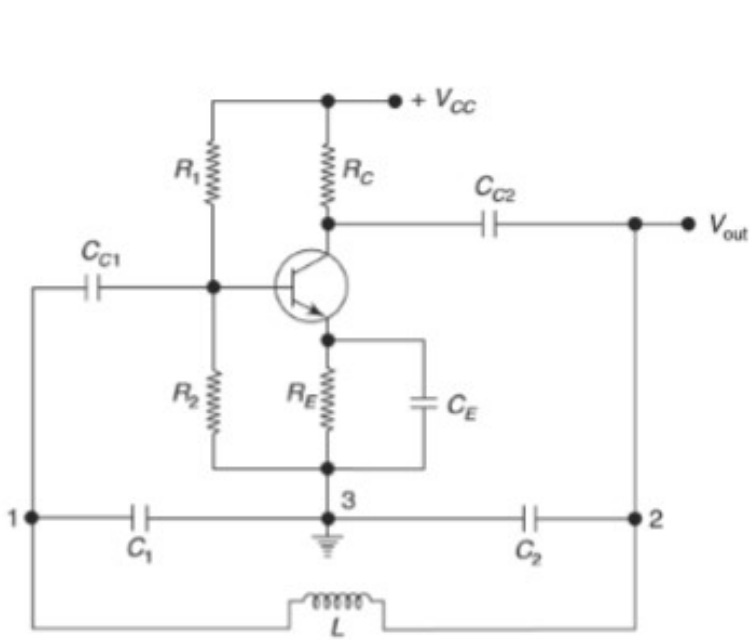


Fig. 15-5 *Colpitts oscillator*

Conditions for Maintenance of Oscillation

For obtaining the conditions for maintenance of oscillation equate

the real part of the basic equation to zero

$$h_{fe} = \frac{C_2}{C_1}$$

Assessment

- In the Colpitts oscillator, C1=0.02 micro Farads and C2=0.02 micro Farads. If the frequency of oscillation is 10 KHz, find the value of the inductor?

THANK YOU