SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

19EET202 / ANALOG ELECTRONICS

II YEAR / III SEMESTER

UNIT-4: FEEDBACK AMPLIFIERS AND OSCILLATORS

WEIN BRIDGE OSCILLATORS

What We'll Discuss

TOPIC OUTLINE

Introduction

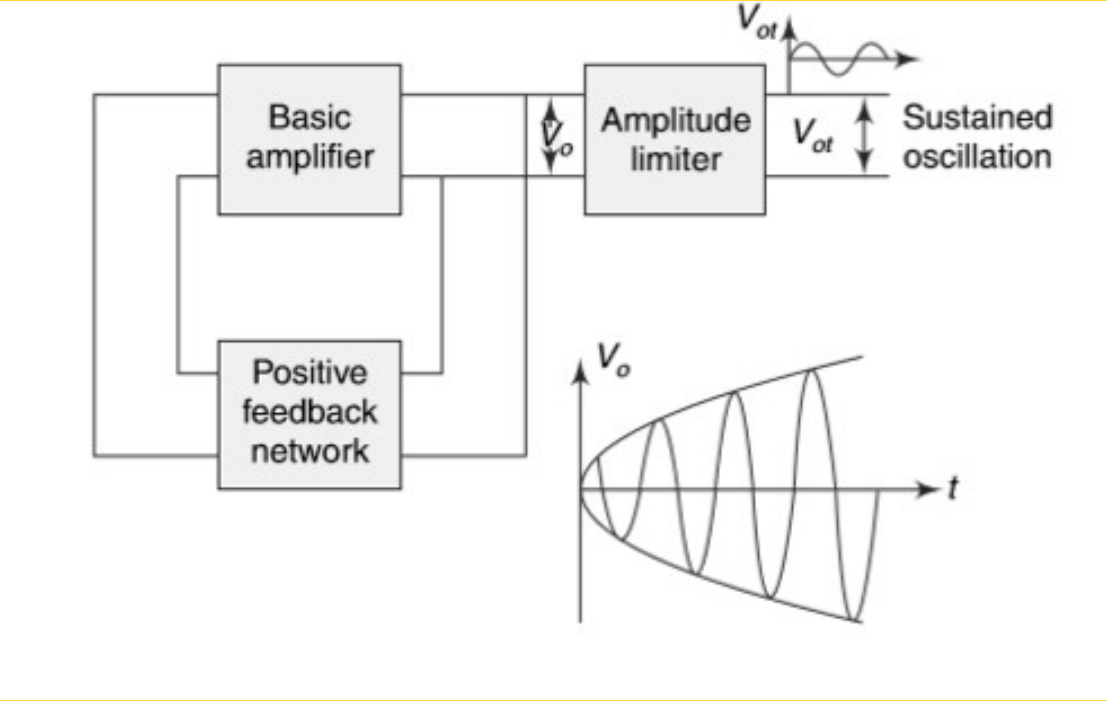
Classification

Working

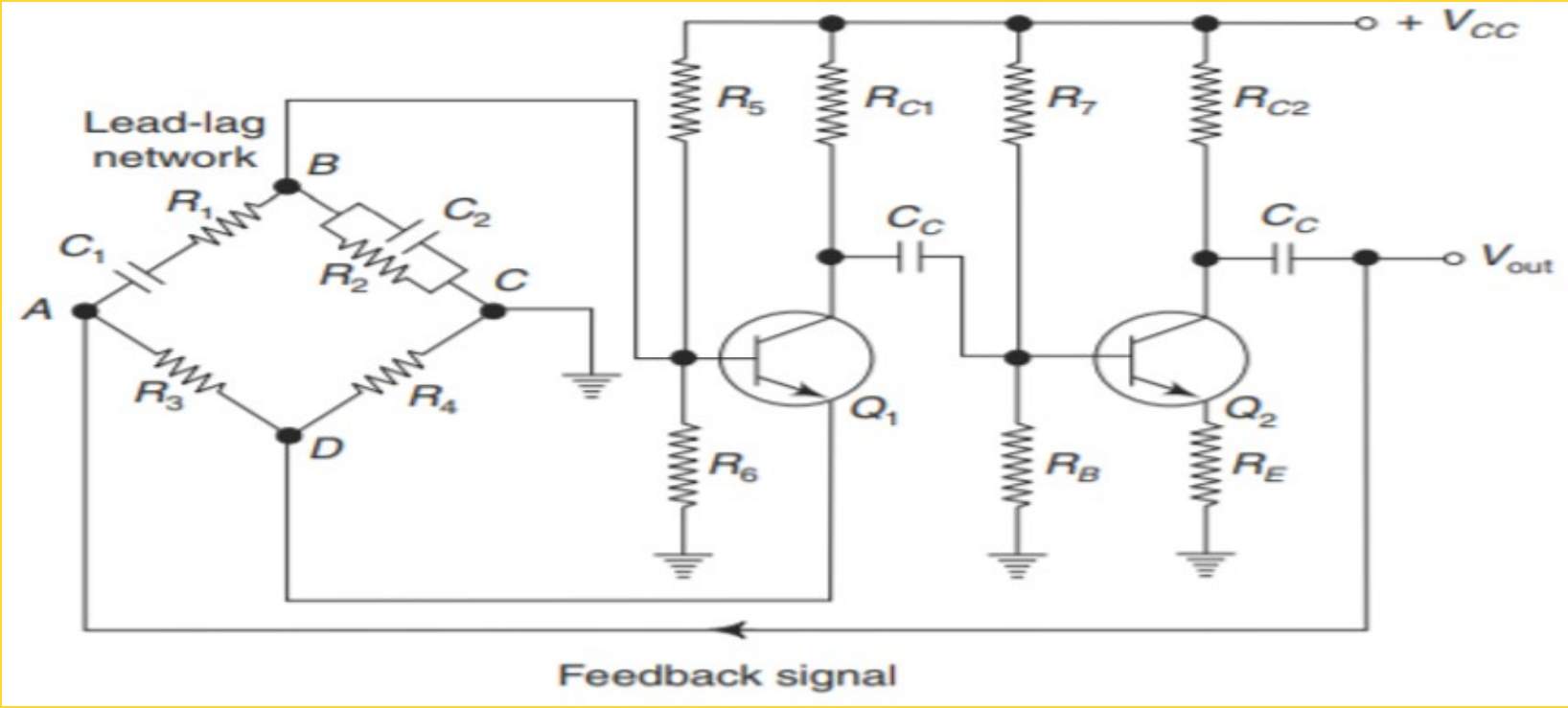
Applications

Need for Oscillators

- Communication Systems
- Control signal

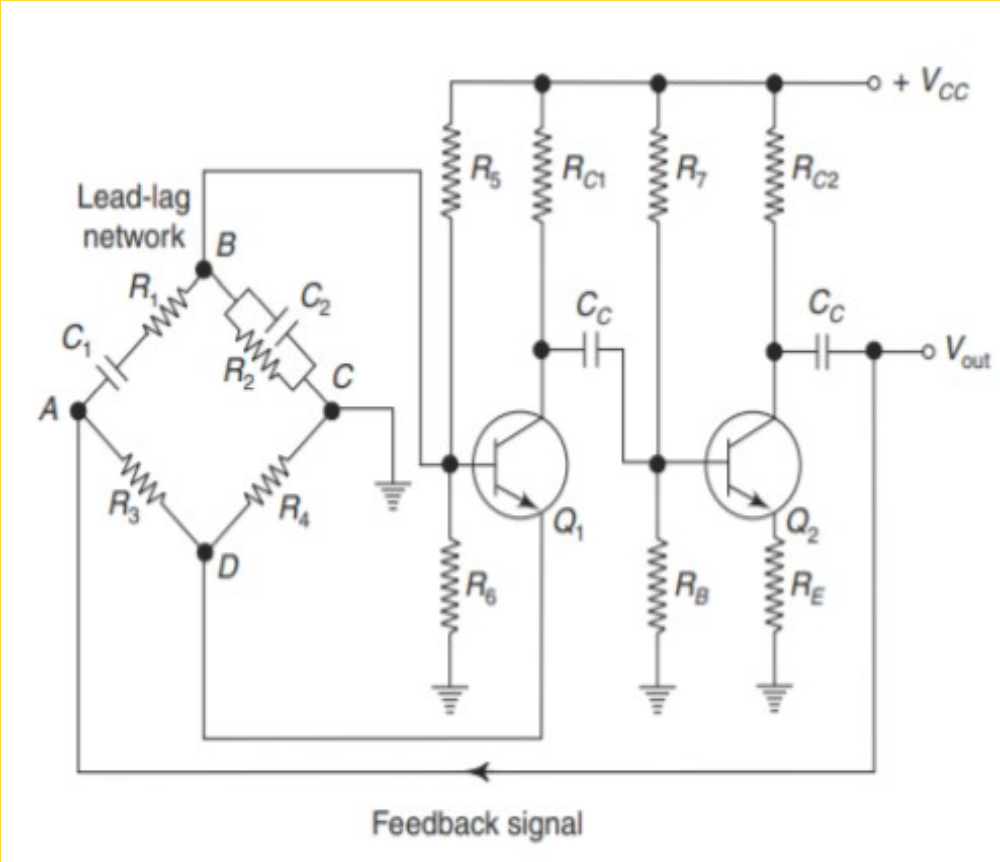


Wein Bridge Oscillator



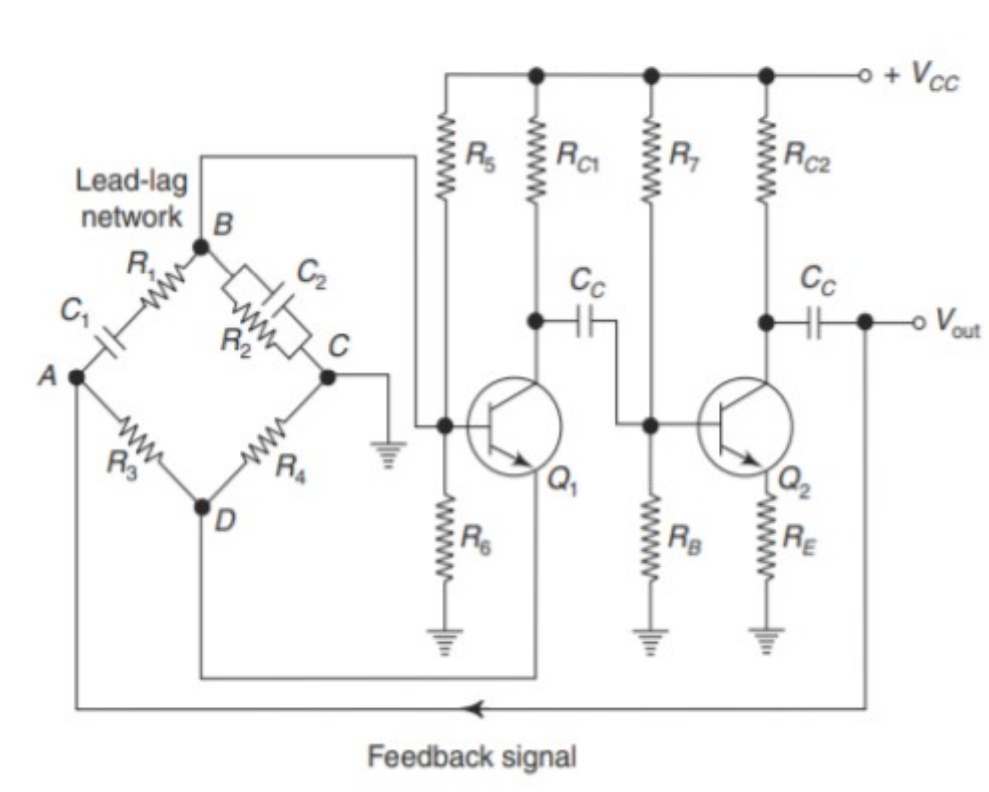
Mechanism of Start of Oscillation

- The feedback network consists of a lead-lag network (R1 – C1 and R2 – C2) and a voltage divider (R3–R4).



Wein Bridge Oscillator

- The lead-lag network provides a positive feedback to the input of the first stage and the voltage divider provides a negative feedback to the emitterofQ1.



Frequency of Oscillation

$$f_o = \frac{1}{2\pi\sqrt{R_1 R_2 C_1 C_2}}$$

$$= \frac{1}{2\pi RC}, \text{ if } R_1 = R_2 = R \text{ and } C_1 = C_2 = C.$$

Problem-I

In an RC phase shift oscillator, if $R_1 = R_2 = R_3 = 200\ \text{k}\Omega$ and $C_1 = C_2 = C_3 = 100\ \text{pF}$. Find the frequency of oscillations.

The frequency of an RC phase shift oscillator is given by

$$f_o = \frac{1}{2\pi RC\sqrt{6}}$$

$$= \frac{1}{2\pi \times 200 \times 10^3 \times 100 \times 10^{-12}\sqrt{6}}$$

$$= 3.248\ \text{kHz}$$

Problem-II

In a Wien-bridge oscillator, if the value of R is 100 kΩ, and frequency of oscillation is 10 kHz, find the value of capacitor C.

Solution The operating frequency of a Wien-bridge oscillator is given by

$$f_o = \frac{1}{2\pi RC}$$

Therefore,

$$C = \frac{1}{2\pi R f_o}$$

$$= \frac{1}{2\pi \times 100 \times 10^3 \times 10 \times 10^3} = 159 \text{ pF}$$

Fréquency of Oscillation

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

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

$$\left[L_1 + L_2 + 2M - \frac{1}{\omega_o^2 C}\right] = 0$$

$$f_o = \frac{\omega_o}{2\pi} = \frac{1}{2\pi\sqrt{(L_1 + L_2 + 2M)\,C}}$$

Assessment 1

Determine the frequency of oscillations when a RC phase-shift oscillator has $R = 10\ k\Omega$, $C = 0.01\ \mu F$ and $R_C = 2.2\ k\Omega$. Also, find the minimum current gain needed for this purpose.

Reference

Electronic Devices and Circuits By Salivahanan

THANK YOU