SNS COLLEGE OF TECHNOLOGY

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE NAME : 19ECB201-ANALOG ELECTRONIC CIRCUITS

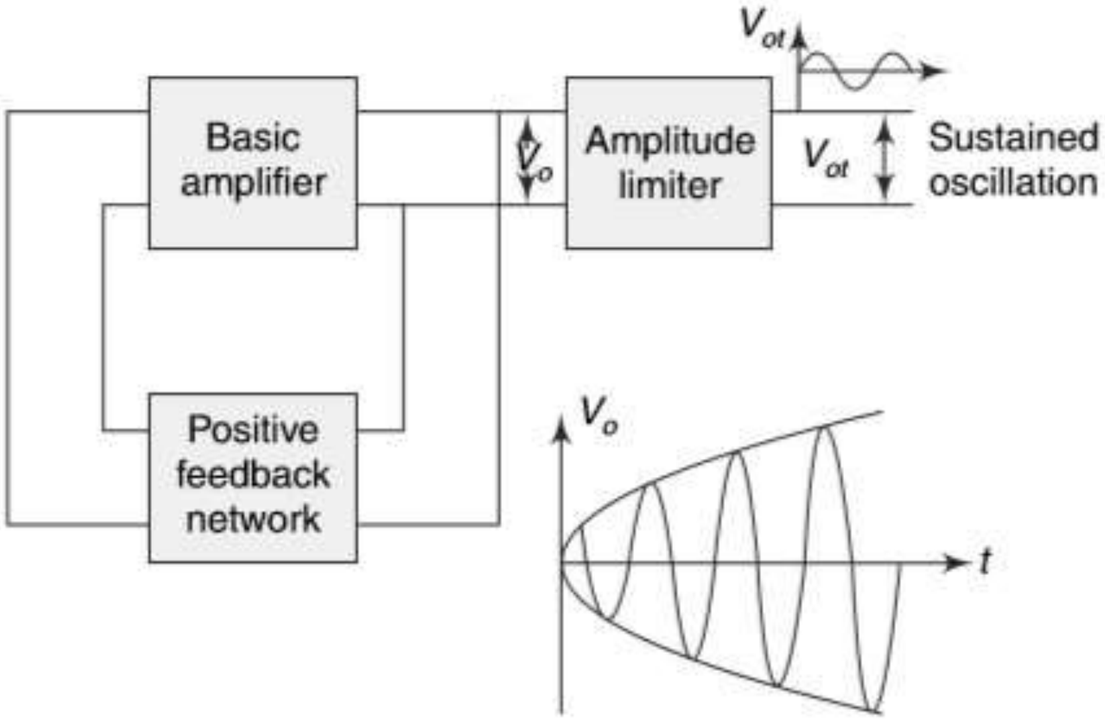
II YEAR /III SEMESTER

Unit 4- OSCILLATORS & MULTIVIBRATOR CIRCUITS

Topic 4 : RC Phase Shift and Wein Bridge Oscillators

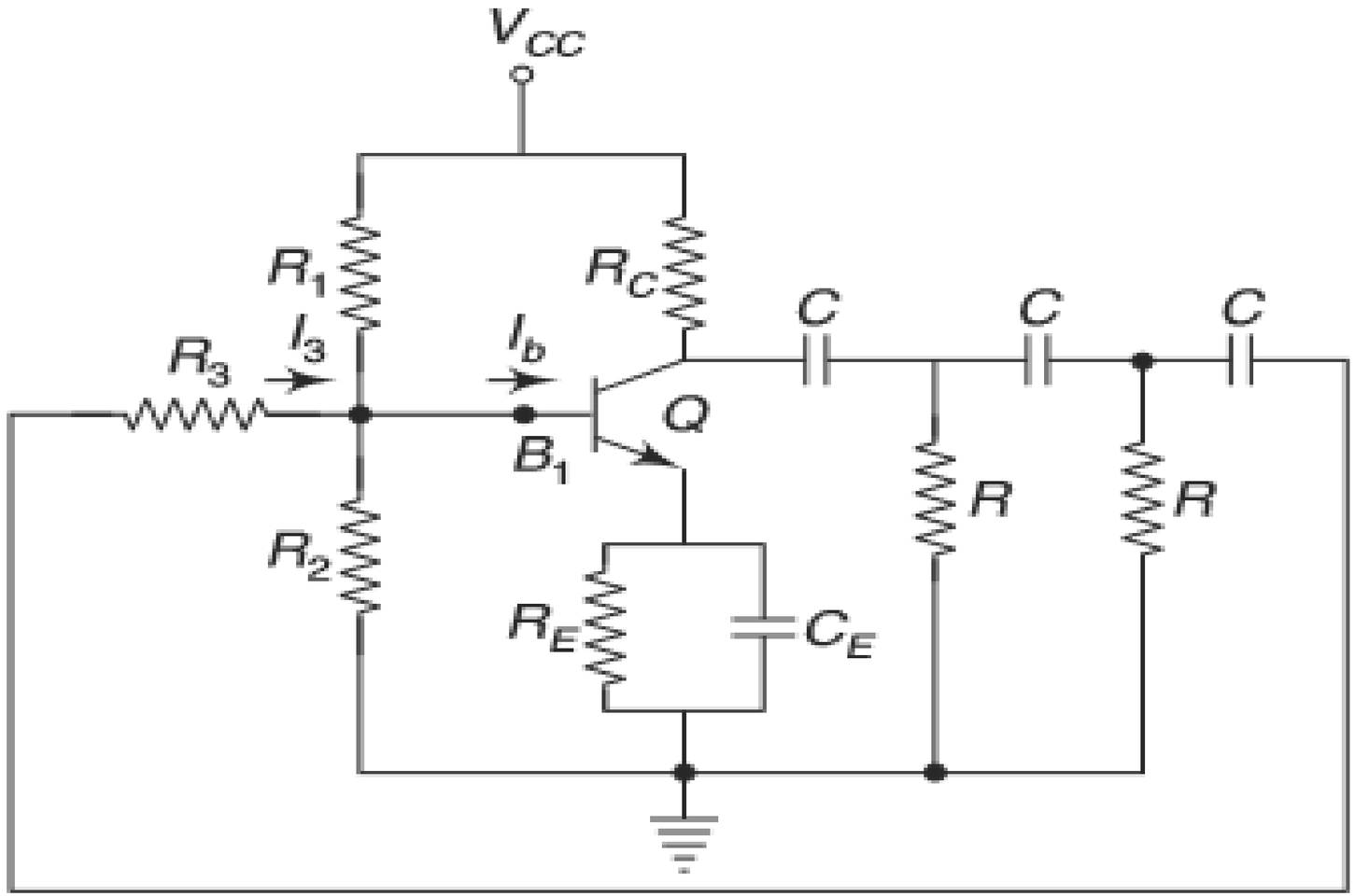
Application of Oscillators

- Communication Systems
- Control signals

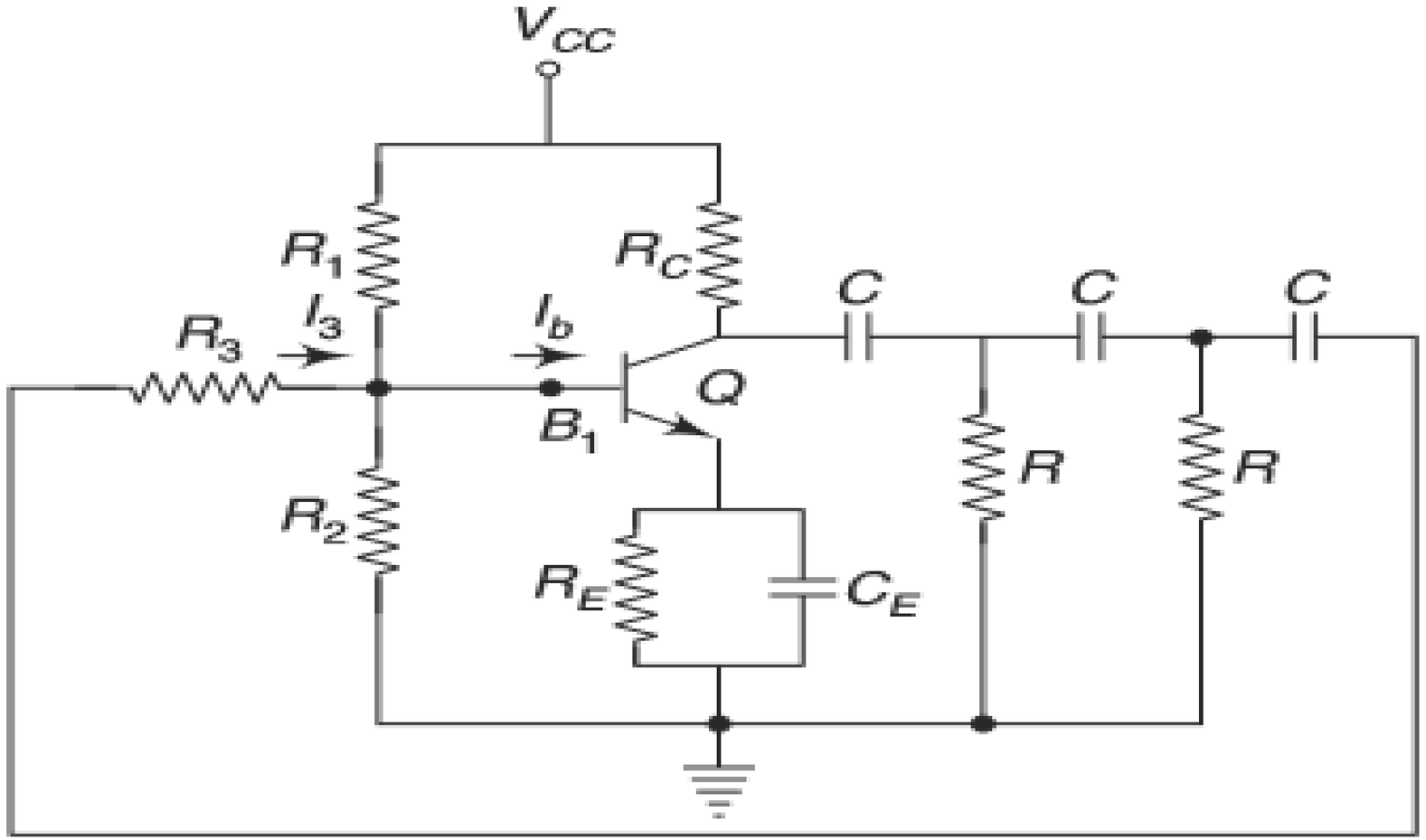


RC Phase Shift Oscillator Circuit

- NPN transistor
- Conditions for oscillations
- Positive Feedback

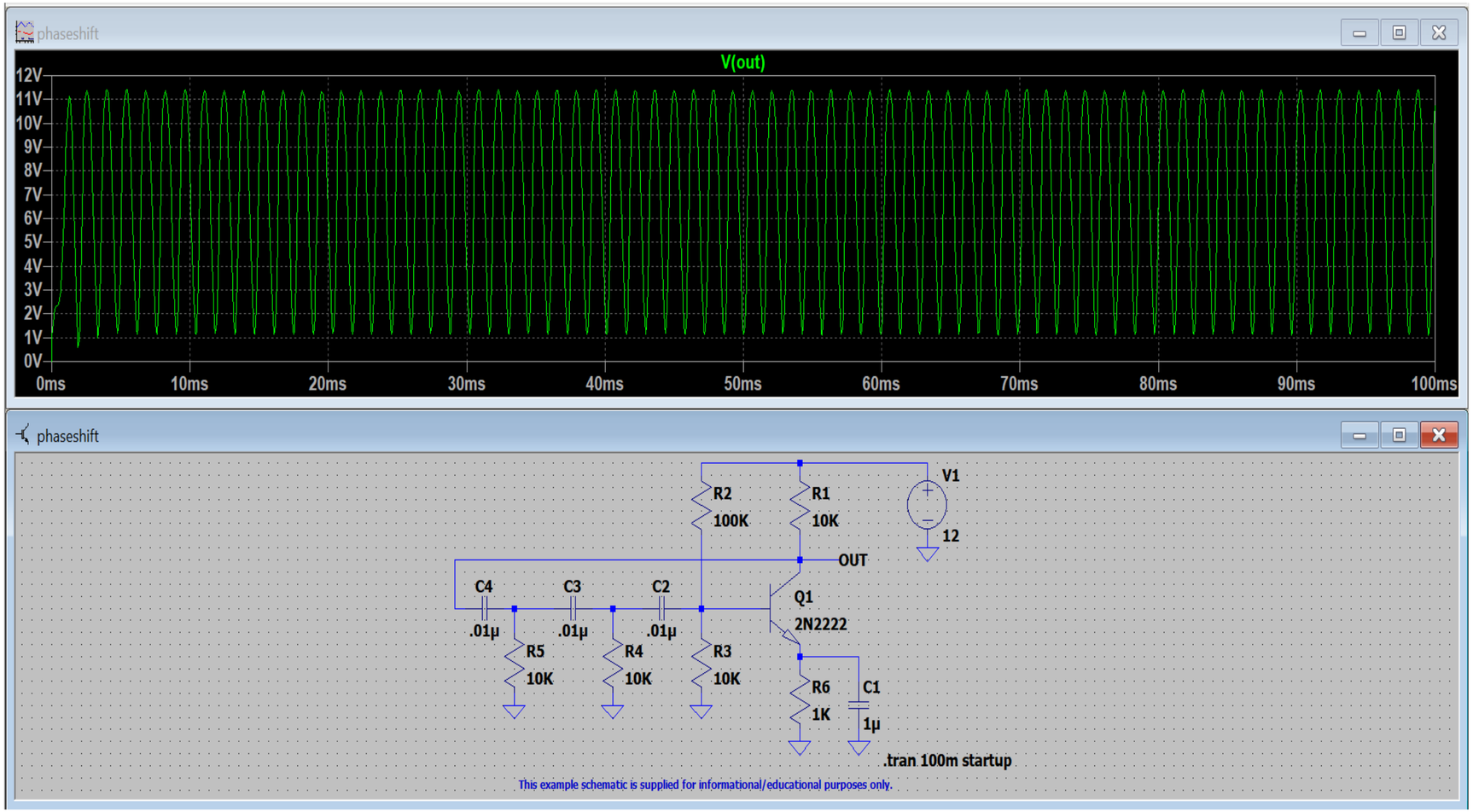


Mechanism of Start of Oscillation



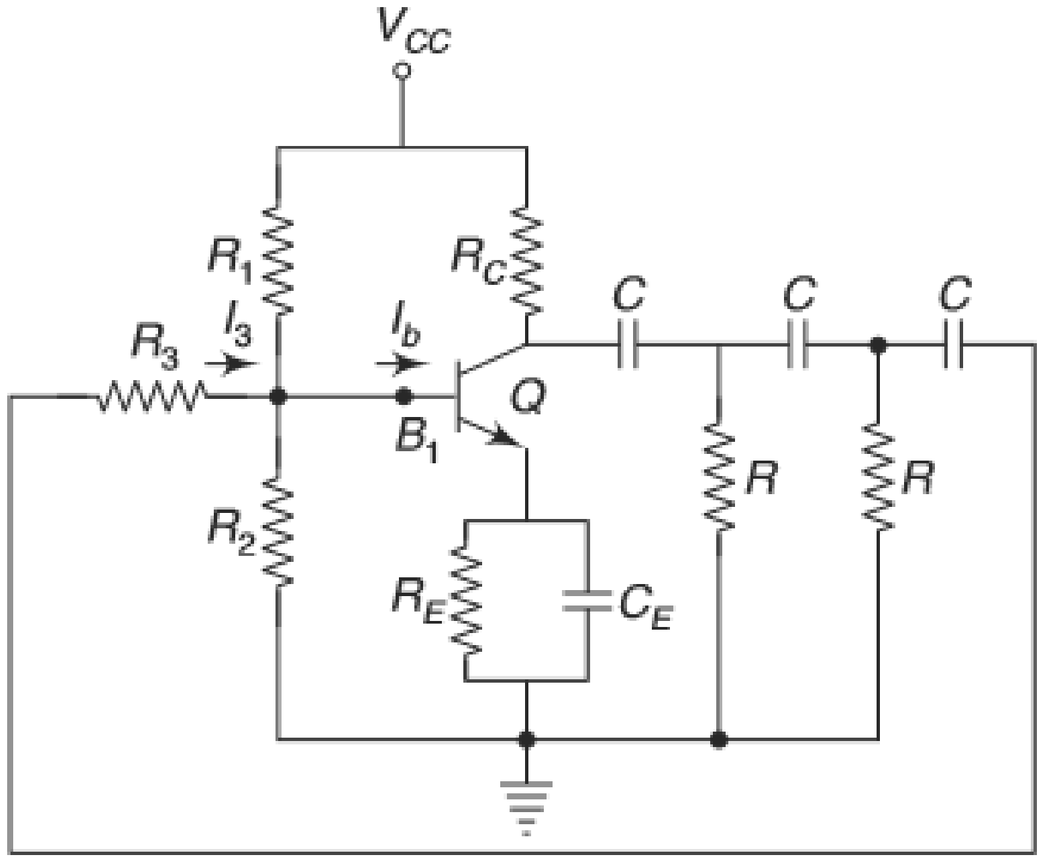
Stabilization of Amplitude

Amplitude Limiting



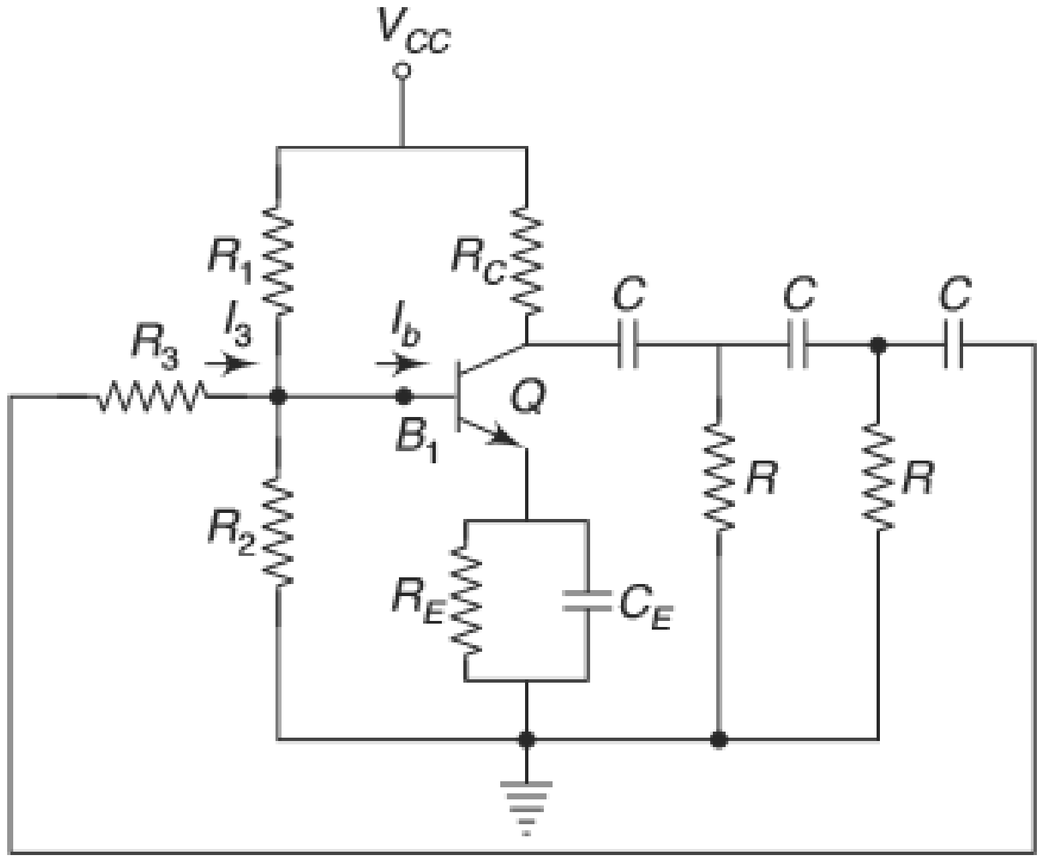
Frequency of Oscillation

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



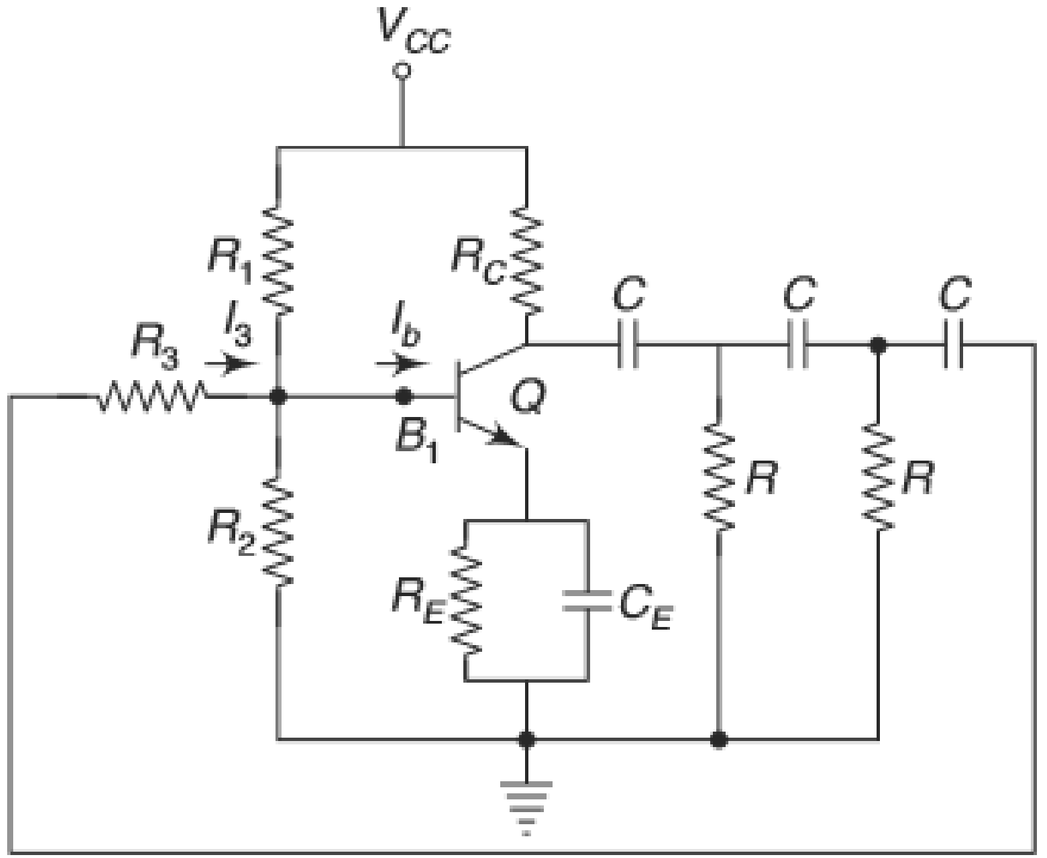
Role of RC Network

Phase shift of each RC stage is 60 degree

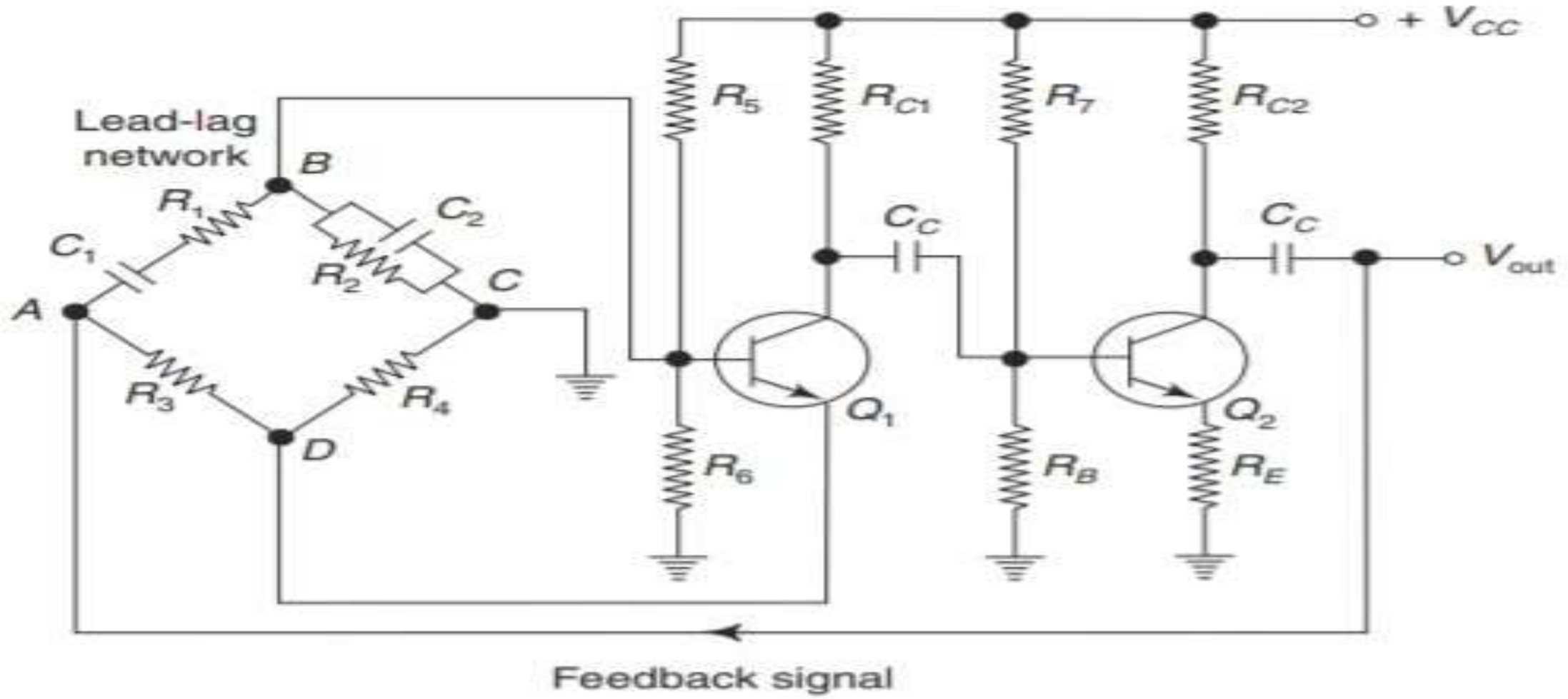


Amplitude Limiting by RC Stages

Signal compressed by RC stages

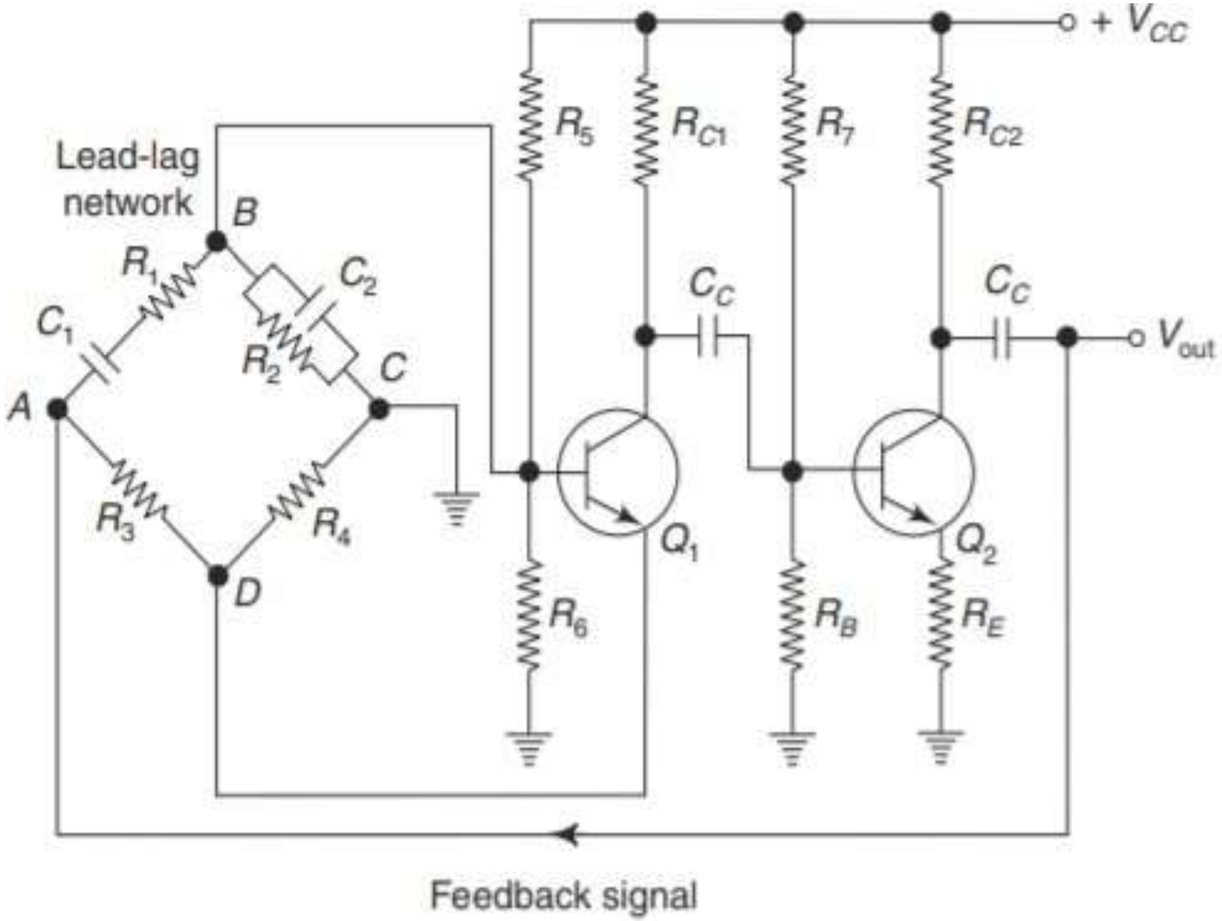


Wein Bridge Oscillator

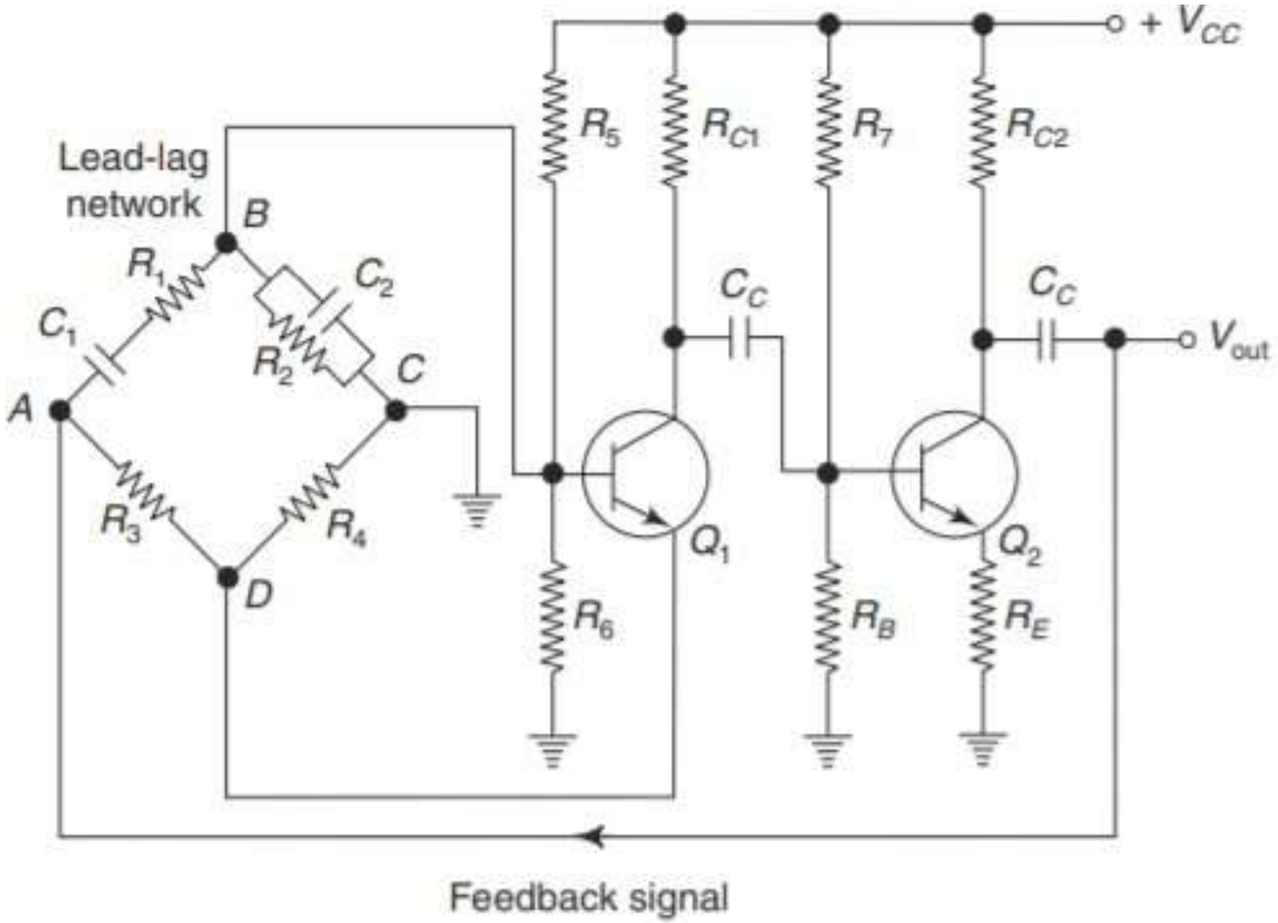


Wein Bridge Oscillator

- 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 emitter of Q1.

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,

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

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

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.

References

Electronic Devices and Circuits By Salivahanan

Thank You