SNS COLLEGE OF TECHNOLOGY

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COIMBATORE-35
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23EET104 / ANALOG ELECTRONICS CIRCUITS
I YEAR / II SEMESTER

UNIT-V: FEEDBACK AMPLIFIER AND OSCILLATOR

RC PHASE SHIFT OSCILLATOR

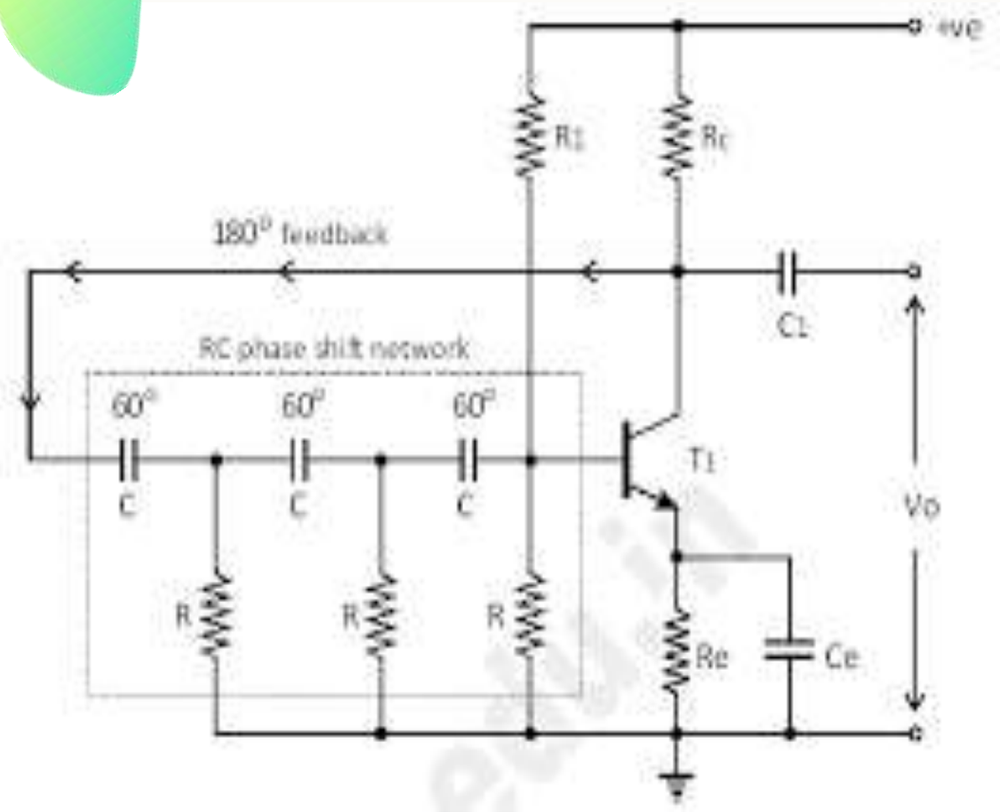
Introduction to RC Phase Shift Oscillators

Oscillators produce continuous waveforms autonomously.

Used in clocks, radios, and signal generators.

Main types: sinusoidal and non-sinusoidal oscillators.

by Senthil Kumar R.



What is an RC Phase Shift Oscillator?

Sinusoidal Oscillator with positive feedback

Generates smooth sine wave outputs

RC phase shift network

Provides 180° phase shift via resistor-capacitor sections

Transistor Amplifier

Common-emitter or op-amp adds 180° phase shift

Basic Circuit Diagram

Amplifier

Transistor or operational amplifier

RC Network

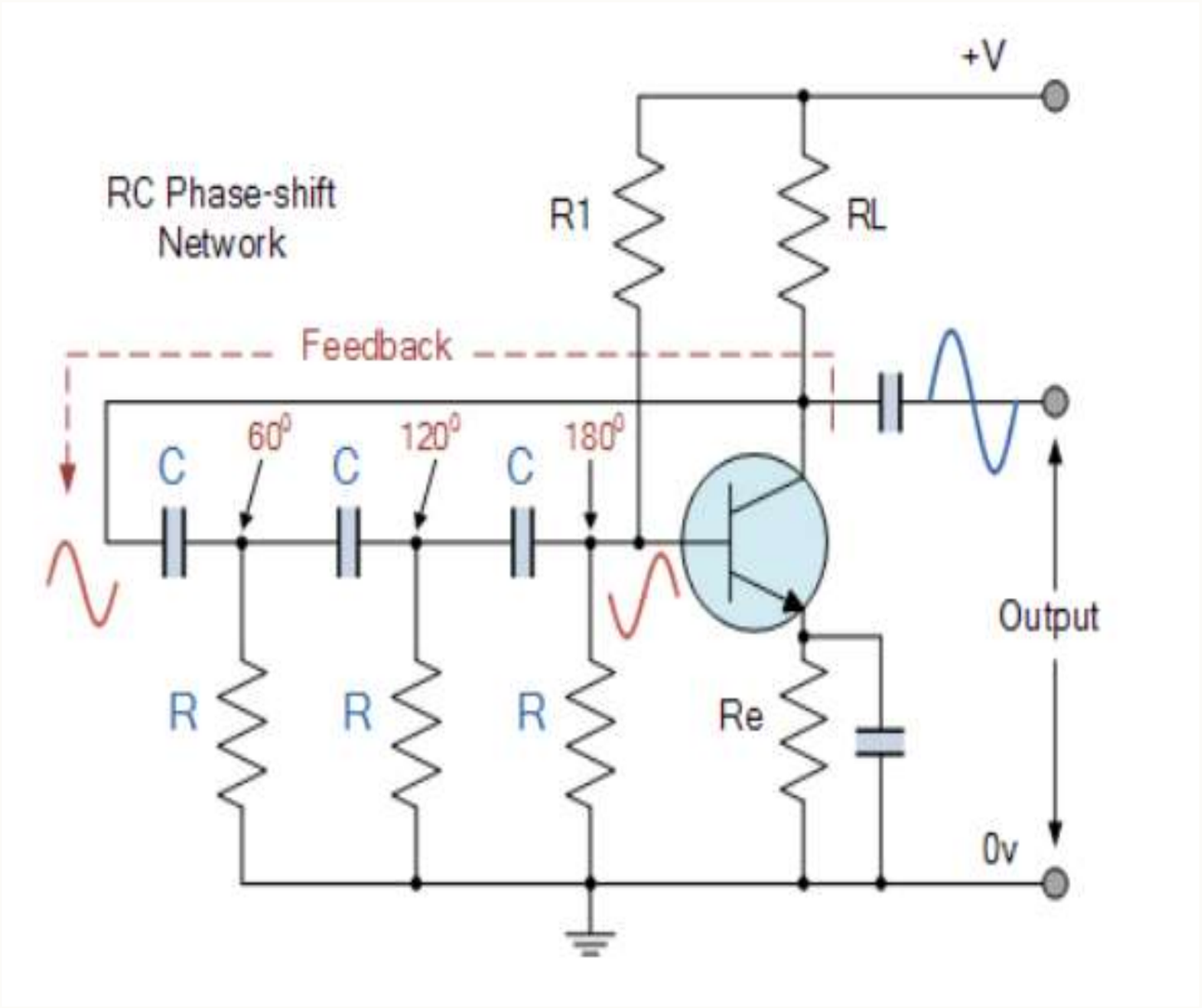
Three cascaded resistor-capacitor sections

Power Supply

Provides necessary voltage and current

Output

Continuous sinusoidal waveform



Components Used

Resistors (R)

Set phase shift and control gain

Capacitors (C)

Work with resistors in phase shift network

Amplifier

BJT or operational amplifier for gain

Power Supply

Supplies energy for oscillation

Working Principle

•The primary component of an RC phase shift oscillator is a phase shift network consisting of a series of resistors and capacitors.

•This network generates a phase shift of 180 degrees at the desired oscillation frequency, which is then combined with an additional 180 degrees of phase shift from an amplifier to create a total of 360 degrees phase shift.

•When the total phase shift is equal to an integer multiple of 360 degrees

•Hence a stable oscillation is achieved.

Frequency of Oscillation

Formula

f = 1 / (2πRC√6) for 3 RC stages

R

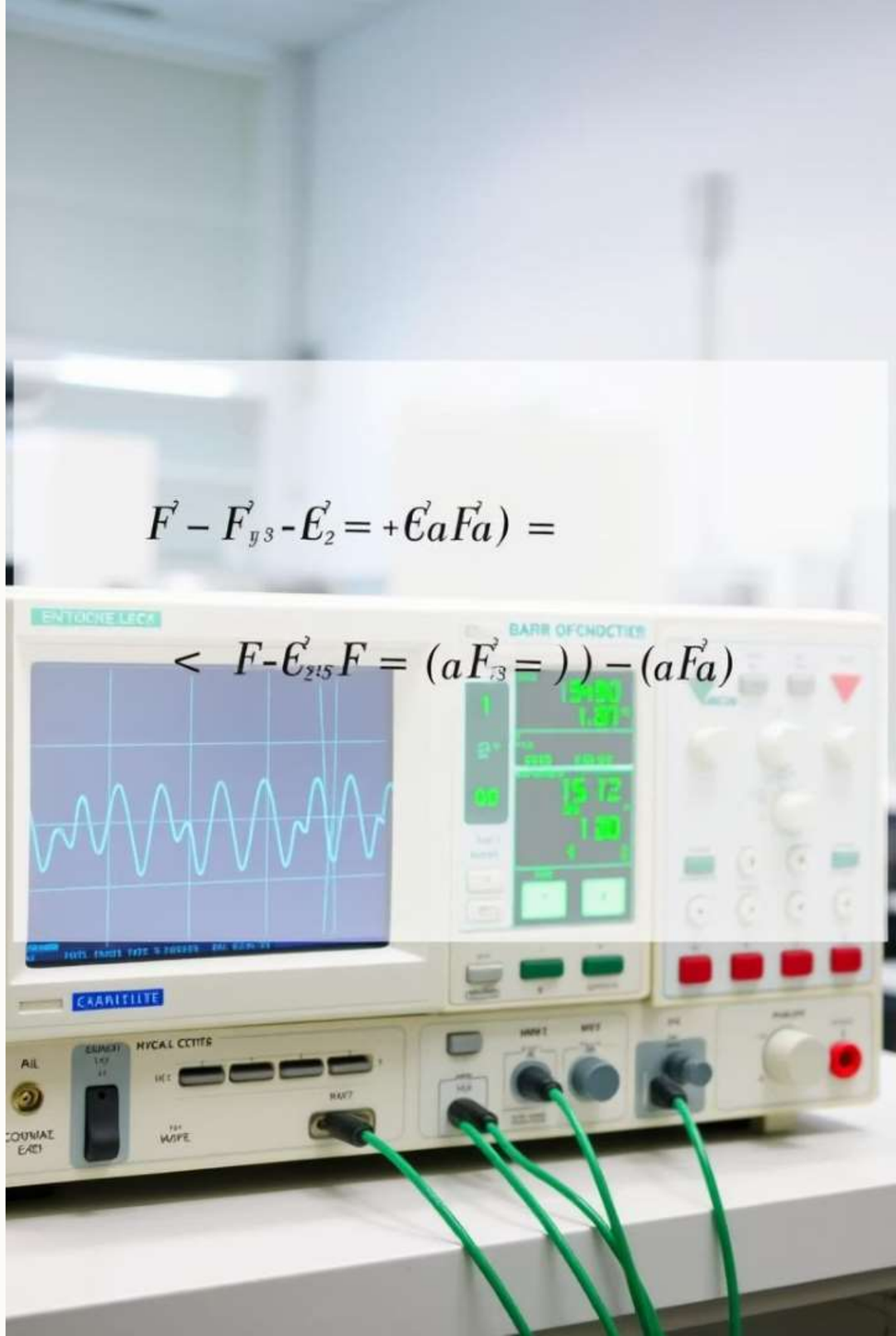
Resistance controls frequency

C

Capacitance adjusts oscillation rate

Frequency

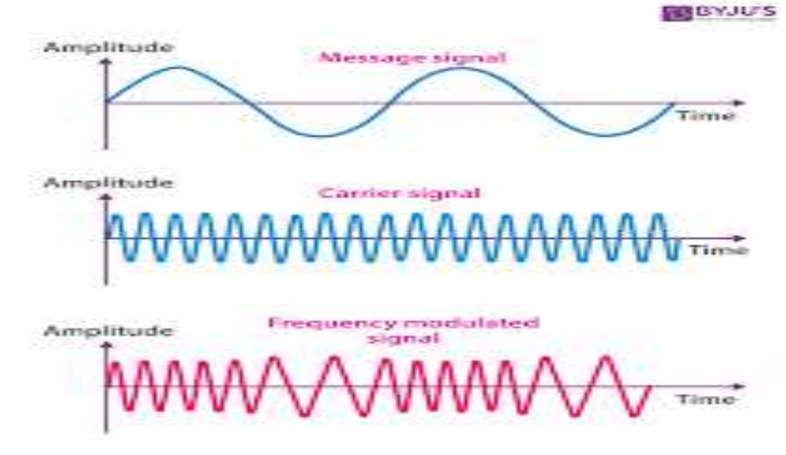
Dependent on R and C values



Barkhausen Criteria

1. Loop Gain ≥ 1
2. Total Phase Shift = 360°
3. RC Network Phase Shift = 180°
4. Amplifier Phase Shift = 180°

Advantages & Disadvantages



Advantages

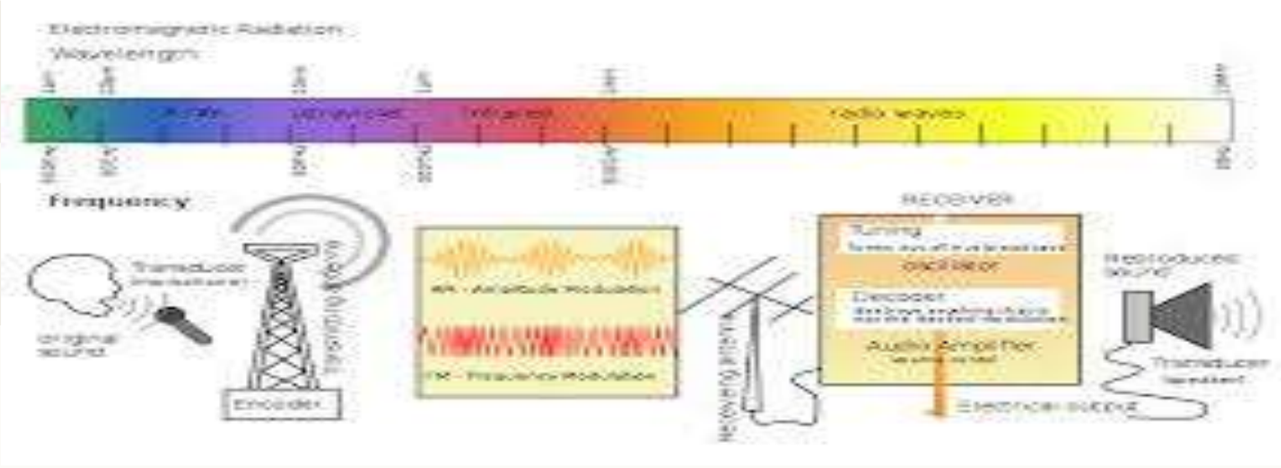
- Simple, low cost design
- Good frequency stability

Disadvantages

- Limited to low frequencies
- Amplitude varies with temp/supply

Applications

- Audio Frequency Generation
- Sine Wave Generators
- Function Generators
- Signal Modulation Systems



Conclusion

- Low-Frequency Sine Wave Source
  - Easy Implementation
    - Uses basic resistors, capacitors, and amplifiers
    - Relies on Phase Shift & Feedback
      - Positive feedback sustains oscillation