# RESONANCE FREQUENCY

## AC CIRCUITS


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# TOPIC OUTLINE

**Series Resonance**

**Parallel Resonance**

# SERIES RESONANCE

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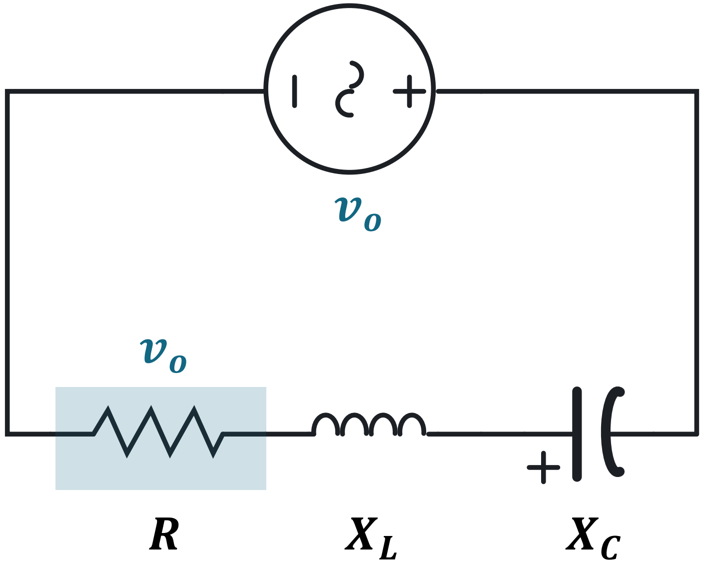
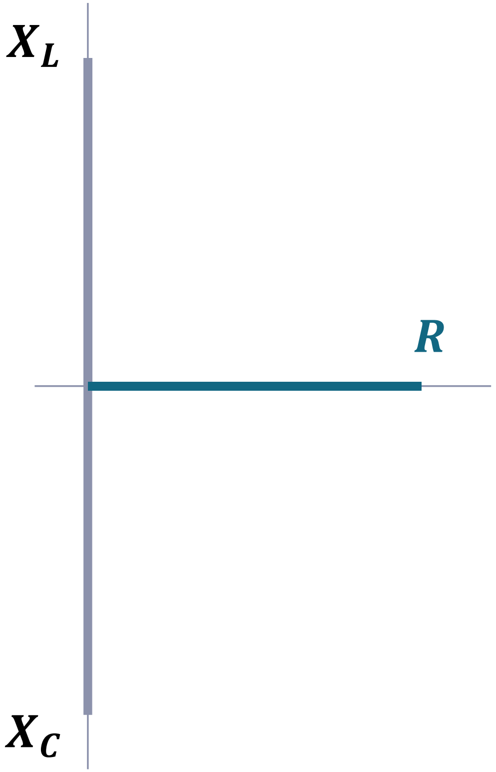
Circuit Diagram




Formula

$$f_R = \frac{1}{2\pi\sqrt{LC}}$$

Let $X_L = X_C$



# EXERCISE

A series circuit consists of a $\mathbf{30\ \Omega}$ resistor, a $\mathbf{0.104\ \boldsymbol{H}}$ inductor, and a $\mathbf{40\ \boldsymbol{\mu F}}$ capacitor. If a variable-frequency $\mathbf{120\ \boldsymbol{V}}$ source is connected across its terminals, for the condition of resonant determine the following:

Solution

a. The resonant frequency ($\boldsymbol{f_R}$)

b. The circuit current ($\boldsymbol{i_R}$) and power ($\boldsymbol{P_R}$)

c. The voltage drop across the resistor ($\boldsymbol{v_R}$), the inductor ($\boldsymbol{v_L}$), and the capacitor ($\boldsymbol{v_C}$)

# PARALLEL RESONANCE

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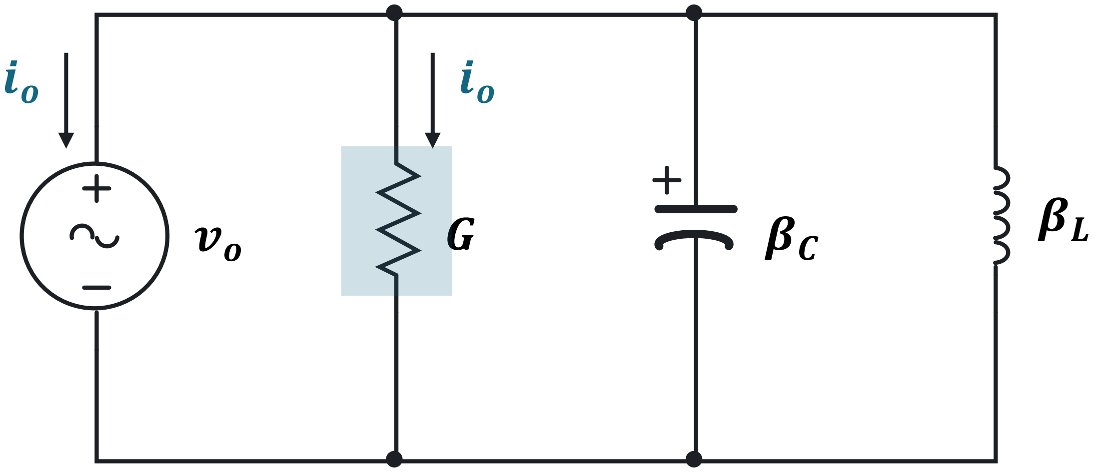
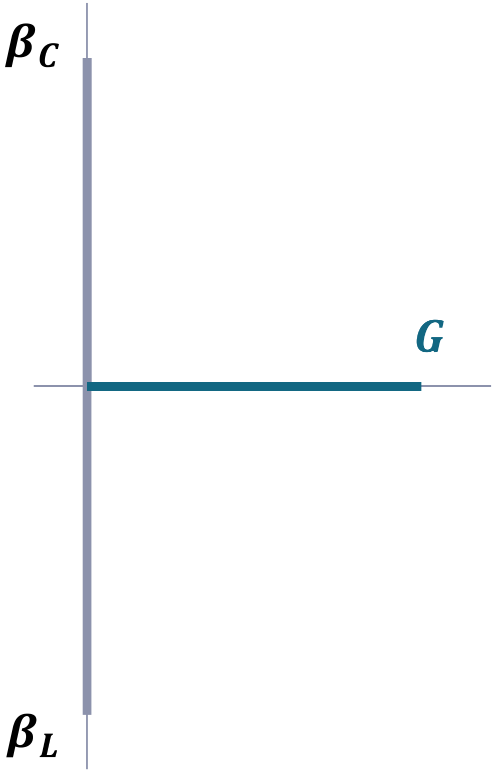
Circuit Diagram




Formula

$$f_R = \frac{1}{2\pi\sqrt{LC}}$$

Let $\beta_L = \beta_C$



# EXERCISE

A parallel circuit consists of a $\mathbf{10\,\Omega}$ resistor, a $\mathbf{2\,H}$ inductor, and a $\mathbf{50\,\mu F}$ capacitor. If a variable-frequency $\mathbf{1\,V}$ source is connected across its terminals, for the condition of resonant determine the following:

a. The resonant frequency ($\boldsymbol{f_R}$)

b. The circuit current ($\boldsymbol{i_R}$) and power ($\boldsymbol{P_R}$)

c. The voltage drop across the resistor ($\boldsymbol{v_R}$), the inductor ($\boldsymbol{v_L}$), and the capacitor ($\boldsymbol{v_C}$)

Solution

# RESONANCE FREQUENCY

$$f_R = \frac{1}{2\pi\sqrt{LC}}$$

Resultant reactance is zero $[X_L = X_C]$

Circuit behaves like a **pure resistance**

Total current is **in phase** with the impressed voltage

Power factor is **unity**

# LABORATORY