Chapter 23   AC Circuits

Alternating Current with Resistor

- **Resistors - Amplitude and Phase**
  - **Amplitude**
  - **Phase**

23.1   Capacitors and Capacitive Reactance in AC Circuits
- **Capacitor Refresher**
- **Qualitatively**
- **Quantitatively**
- **Amplitude & Phase**
  - **Amplitude**
    - **Compare Quantitative and Qualitative:**
    - **Capacitive Reactance: "Ohm's Law for AC Capacitance"**

Example 1: Say we have a mystery capacitor and we want to identify its capacitance. So we plug it into a typical 120 V (rms), 60 Hz, supply and measure an rms current of 0.02 Amps. What is the capacitance?

23.2   Inductors and Inductive Reactance in AC Circuit
  - **Qualitatively**
  - **Quantitatively**
  - **Amplitude and Phase**
    - **Amplitude**
              Qualitative – Quantitative
      - **Inductive Reactance: "Ohm's Law for AC inductance"**

Example 2: A 0.047 H inductor is wired across the terminals of an AC generator that has a voltage of 2.1 Volts and supplies a current of 0.023 Amps. What is the frequenc y of the generator?

Summary
    Resistors
    Capacitors
    Inductors

23.3   Circuits Containing Resistance, Capacitance, and Inductance
  - **Current**
  - **Voltage**
    - **Rms**
  - **Equivalent Circuit**
    - **Vocab: Impedance = Z**

Example 3: A Series RCL circuit has a frequency of 6 kHz and an rms current of 0.05 Amps. It is connected to a 400 Ohm resistor, a 0.5 µf capacitor, and a 0.03 Henry Inductor. What is the Voltage of the generator?

23.4   Resonance in Electric Circuits
  - **Resonance Frequency**.

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2. What voltage is needed to create a current of 35 mA in a circuit containing only a 0.86-µF capacitor, when the frequency is 3.4 kHz?

12. A 30.0-mH inductor has a reactance of 2.10 kΩ. (a) What is the frequency of the ac current that passes through the inductor? (b) What is the capacitance of a capacitor that has the same reactance at this frequency? The frequency is tripled, so that the reactances of the inductor and capacitor are no longer equal. What are the new reactances of (c) the inductor and (d) the capacitor?

18. A 2700-Ω resistor and a 1.1-µF capacitor are connected in series across a generator (60.0 Hz, 120 V). Determine the power dissipated in the circuit. Recall: $\bar{P} = I_{rms}^2 R$ and $I_{rms} = V_{rms} / Z$.

26. A series RCL circuit has a resonant frequency of 690 kHz. If the value of the capacitance is 2.0×10^{-9} F, what is the value of the inductance?