

Homework 12

1. A 2.5×10^{-5} F capacitor and a 2.8×10^{-2} H inductor are wired in series. The capacitor has a charge across its plates when the components are connected in a simple loop circuit at time $t = 0$ s. The maximum current in the resulting circuit is 7.5 A. What is the current at time $t = 1.6$ s?
2. A simple loop circuit has an inductor with inductance 4.6×10^{-3} H and a capacitor with capacitance 2.8×10^{-6} F in series. At a certain time, the current is at its maximum, 5.1 A. (a) What is the charge on the capacitor at this time? (b) What is the maximum charge on the capacitor?
3. What is the relative phase between the voltage and the current of an AC circuit that has a 7000 ohm resistor in series with a $0.860 \mu\text{F}$ capacitor and a 0.300 H inductor? The circuit is being driven by an alternating voltage source, at an angular frequency of 600 rad/s.
4. Many radios are able to pick up different radio stations by using a capacitor whose capacitance can be changed by rotating a knob. The angular frequency of the circuit then matches the broadcast frequency. All AM radio stations broadcast between 5.30×10^5 Hz and 1.71×10^6 Hz. If the receiver uses a 5.00×10^{-3} H inductor, what is the range of capacitance needed to receive all possible AM radio stations?
5. The emf of an AC circuit has an rms value of 120 V. (a) What is the maximum positive emf? (b) What is the most negative emf?
6. If the maximum current in an AC circuit is 9.00 A, what is the rms current?
7. An electrical appliance draws an rms current of 10.0 A and has an average heat dissipating power of 20 W when connected to a power source with an rms emf of 120 V at 60.0 Hz. The appliance could be analyzed as a series combination of a resistor, a capacitor and an inductor. (a) what is the value of the series resistance? (b) What is the impedance of the appliance?