

HOMWORK PROBLEMS

Section 7.1: Power in AC Circuits

- 7.1** The heating element in a soldering iron has a resistance of $30\ \Omega$. Find the average power dissipated in the soldering iron if it is connected to a voltage source of $117\ \text{V rms}$.
- 7.2** A coffeemaker has a rated power of $1,000\ \text{W}$ at $240\ \text{V rms}$. Find the resistance of the heating element.
- 7.3** A current source $i(t)$ is connected to a $50\text{-}\Omega$ resistor. Find the average power delivered to the resistor, given that $i(t)$ is
- $5 \cos 50t\ \text{A}$
 - $5 \cos(50t - 45^\circ)\ \text{A}$
 - $5 \cos 50t - 2 \cos(50t - 0.873)\ \text{A}$
 - $5 \cos 50t - 2\ \text{A}$
- 7.4** Find the rms value of each of the following periodic currents:
- $\cos 450t + 2 \cos 450t$
 - $\cos 5t + \sin 5t$
 - $\cos 450t + 2$
 - $\cos 5t + \cos(5t + \pi/3)$
 - $\cos 200t + \cos 400t$
- 7.5** A current of $4\ \text{A}$ flows when a neon light advertisement is supplied by a 110-V rms power system. The current lags the voltage by 60° . Find the power dissipated by the circuit and the power factor.
- 7.6** A residential electric power monitoring system rated for 120-V rms , 60-Hz source registers power consumption of $1.2\ \text{kW}$, with a power factor of 0.8 . Find
- The rms current.
 - The phase angle.
 - The system impedance.
 - The system resistance.
- 7.7** A drilling machine is driven by a single-phase induction machine connected to a 110-V rms supply. Assume that the machining operation requires $1\ \text{kW}$, that the tool machine has 90 percent efficiency, and that the supply current is $14\ \text{A rms}$ with a power factor of 0.8 . Find the AC machine efficiency.
- 7.8** Given the waveform of a voltage source shown in Figure P7.8, find:
- The steady DC voltage that would cause the same heating effect across a resistance.

- The average current supplied to a $10\text{-}\Omega$ resistor connected across the voltage source.
- The average power supplied to a $1\text{-}\Omega$ resistor connected across the voltage source.

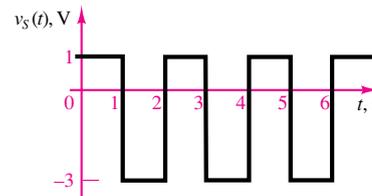


Figure P7.8

- 7.9** A current source $i(t)$ is connected to a $100\text{-}\Omega$ resistor. Find the average power delivered to the resistor, given that $i(t)$ is:
- $4 \cos 100t\ \text{A}$
 - $4 \cos(100t - 50^\circ)\ \text{A}$
 - $4 \cos 100t - 3 \cos(100t - 50^\circ)\ \text{A}$
 - $4 \cos 100t - 3\ \text{A}$
- 7.10** Find the rms value of each of the following periodic currents:
- $\cos 377t + \cos 377t$
 - $\cos 2t + \sin 2t$
 - $\cos 377t + 1$
 - $\cos 2t + \cos(2t + 135^\circ)$
 - $\cos 2t + \cos 33$

Section 7.2: Complex Power

- 7.11** A current of $10\ \text{A rms}$ flows when a single-phase circuit is placed across a 220-V rms source. The current lags the voltage by 60° . Find the power dissipated by the circuit and the power factor.
- 7.12** A single-phase circuit is placed across a 120-V rms , 60-Hz source, with an ammeter, a voltmeter, and a wattmeter connected. The instruments indicate $12\ \text{A}$, $120\ \text{V}$, and $800\ \text{W}$, respectively. Find
- The power factor.
 - The phase angle.
 - The impedance.
 - The resistance.
- 7.13** For the following numeric values, determine the average power, P , the reactive power, Q , and the