

SECTION 3-9 POWER FORMULAS

In Probs. 3-39 to 3-51, solve for the unknowns listed.

- 3-38 How much power is dissipated by an $8\text{-}\Omega$ load if the current in the load is 200 mA ?
- 3-37 How much power is dissipated by a $600\text{-}\Omega$ load if the voltage across the load is 36 V ?
- 3-36 How much power is dissipated by a $50\text{-}\Omega$ load if the voltage across the load is 100 V ?
- 3-35 How much power is dissipated by a $5.6\text{-k}\Omega$ resistor whose current is 9.45 mA ?
- 3-34 a. $I = 40\text{ mA}$, $R = 10\text{ k}\Omega$, $P = ?$
 b. $I = 3.33\text{ A}$, $R = 20\text{ }\Omega$, $P = ?$
 c. $V = 100\text{ mV}$, $R = 10\text{ }\Omega$, $P = ?$
 d. $V = 1\text{ kV}$, $R = 10\text{ M}\Omega$, $P = ?$
- 3-33 a. $I = 300\text{ }\mu\text{A}$, $R = 22\text{ k}\Omega$, $P = ?$
 b. $I = 50\text{ mA}$, $R = 270\text{ }\Omega$, $P = ?$
 c. $V = 70\text{ V}$, $R = 200\text{ k}\Omega$, $P = ?$
 d. $V = 8\text{ V}$, $R = 50\text{ }\Omega$, $P = ?$
- 3-32 a. $I = 1\text{ A}$, $R = 100\text{ }\Omega$, $P = ?$
 b. $I = 20\text{ mA}$, $R = 1\text{ k}\Omega$, $P = ?$
 c. $V = 5\text{ V}$, $R = 150\text{ }\Omega$, $P = ?$
 d. $V = 22.36\text{ V}$, $R = 1\text{ k}\Omega$, $P = ?$

SECTION 3-8 POWER DISSIPATION IN RESISTANCE

In Probs. 3-32 to 3-38, solve for the power, P , dissipated by the resistance, R .

- 3-31 How much will it cost to run an electric motor for 10 days if the motor draws 15 A of current from the 240-V power line? The cost of electricity is 7.5¢/kWh .
- 3-30 How much does it cost to light a 300-W lightbulb for 30 days if the cost of electricity is 7¢/kWh ?
- 3-29 How much will it cost to operate a 1500-W quartz heater for 48 h if the cost of electricity is 7¢/kWh ?
- 3-28 How much power is consumed by a 12-V incandescent lamp if it draws 150 mA of current when lit?
- 3-27 How much is the output voltage of a power supply if it supplies 75 W of power while delivering a current of 5 A ?
- 3-26 How much current do each of the following lightbulbs draw from the 120-V power line?
- a. 60-W bulb
 b. 75-W bulb
 c. 100-W bulb
 d. 300-W bulb
- 3-25 a. $V = 15.81\text{ V}$, $P = 500\text{ mW}$, $I = ?$
 b. $P = 100\text{ mW}$, $V = 50\text{ V}$, $I = ?$
 c. $V = 75\text{ mV}$, $I = 2\text{ mA}$, $P = ?$
 d. $P = 20\text{ mW}$, $I = 100\text{ }\mu\text{A}$, $V = ?$

- 3-52 Required values of V and I are 54 V and 2 mA .
- 3-53 Required values of V and I are 12 V and 10 mA .
- 3-54 Required values of V and I are 390 V and 1 mA .
- 3-55 Required values of V and I are 36 V and 18 mA .
- 3-56 Required values of V and I are 340 V and $500\text{ }\mu\text{A}$.

In Probs. 3-52 to 3-60, determine the required resistance and appropriate wattage rating of a carbon-film resistor for the specific requirements listed. For all problems, assume that the following wattage ratings are available: $\frac{1}{8}\text{ W}$, $\frac{1}{4}\text{ W}$, $\frac{1}{2}\text{ W}$, 1 W , and 2 W . (Assume the maximum working voltage ratings listed on page 93.)

SECTION 3-10 CHOOSING A RESISTOR FOR A CIRCUIT

- 3-51 What is the resistance of a 20-W , 12-V halogen lamp?
- 3-50 If a $4\text{-}\Omega$ speaker dissipates 15 W of power, how much voltage is across the speaker?
- 3-49 How much voltage is across a resistor if it dissipates 2 W of power when the current is 40 mA ?
- 3-48 How much current does a 960-W coffeemaker draw from the 120-V power line?
- 3-47 What is the resistance of a device that dissipates 1.2 kW of power when its current is 10 A ?
- 3-46 Calculate the maximum voltage that a $390\text{-}\Omega$, $\frac{1}{2}\text{-W}$ resistor can safely handle without exceeding its power rating.
- 3-45 A $50\text{-}\Omega$ load dissipates 200 W of power. How much voltage is across the load?
- 3-44 What is the hot resistance of a 60-W , 120-V lightbulb?
- 3-43 Calculate the maximum current that a $22\text{-k}\Omega$, $\frac{1}{8}\text{-W}$ resistor can safely handle without exceeding its power rating.
- 3-42 Calculate the maximum current that a $1\text{-k}\Omega$, 1-W carbon resistor can safely handle without exceeding its power rating.
- 3-41 a. $P = 50\text{ W}$, $R = 40\text{ }\Omega$, $V = ?$
 b. $P = 2\text{ W}$, $R = 2\text{ k}\Omega$, $V = ?$
 c. $P = 50\text{ mW}$, $V = 500\text{ V}$, $I = ?$
 d. $P = 50\text{ mW}$, $R = 312.5\text{ k}\Omega$, $I = ?$
- 3-40 a. $P = 500\text{ }\mu\text{W}$, $V = 10\text{ V}$, $R = ?$
 b. $P = 150\text{ mW}$, $I = 25\text{ mA}$, $R = ?$
 c. $P = 300\text{ W}$, $R = 100\text{ }\Omega$, $V = ?$
 d. $P = 500\text{ mW}$, $R = 3.3\text{ k}\Omega$, $I = ?$
- 3-39 a. $P = 250\text{ mW}$, $R = 10\text{ k}\Omega$, $I = ?$
 b. $P = 100\text{ W}$, $V = 120\text{ V}$, $R = ?$
 c. $P = 125\text{ mW}$, $I = 20\text{ mA}$, $R = ?$
 d. $P = 1\text{ kW}$, $R = 50\text{ }\Omega$, $V = ?$