**Chapter 32**

1. Figure P32.4 shows three lightbulbs connected to a 120-V AC (rms) household supply voltage. Bulbs 1 and 2 have a power rating of 150 W, and bulb 3 has a 100-W rating. Find (a) the rms current in each bulb and (b) the resistance of each bulb. (c) What is the total resistance of the combination of the three lightbulbs?

**SOLUTION:**

2. An AC source with Δ*V* max = 150 V and *f* = 50.0 Hz is connected between points *a* and *d* in Figure P32.16. Calculate the maximum voltages between (a) points *a* and *b*, (b) points *b* and *c*, (c) points *c* and *d*, and (d) points *b* and *d.*

**SOLUTION:**

3. A series *RLC* circuit has components with the following values: *L =* 20.0 mH, *C* = 100 nF, *R* = 20.0 Ω, and Δ*V* max = 100 V, with Δ*ν* = Δ*V*max sin *ωt.* Find (a) the resonant frequency of the circuit, (b) the amplitude of the current at the resonant frequency, (c) the *Q* of the circuit, and (d) the amplitude of the voltage across the inductor at resonance.

**SOLUTION:**

**Solution for Chapter 32**

1. Figure P32.4 shows three lightbulbs connected to a 120-V AC (rms) household supply voltage. Bulbs 1 and 2 have a power rating of 150 W, and bulb 3 has a 100-W rating. Find (a) the rms current in each bulb and (b) the resistance of each bulb. (c) What is the total resistance of the combination of the three lightbulbs?

**Ans:**

All lamps are connected in parallel with the voltage source, so
 for each lamp.

Also, the current is  and the resistance is .

(a) For the 150-W bulbs,

 

 For the 100-W bulb,

  

 The rms current in each 150-W bulb is 1.25 A. The rms current in the 100-W bulb is 0.833 A.

(b) The resistance in bulbs 1 and 2 is

 

 and the resistance in bulb 3 is

  

(c) The bulbs are in parallel, so

 

2. An AC source with Δ*V* max = 150 V and *f* = 50.0 Hz is connected between points *a* and *d* in Figure P32.16. Calculate the maximum voltages between (a) points *a* and *b*, (b) points *b* and *c*, (c) points *c* and *d*, and (d) points *b* and *d.*

**Ans:**

We first determine the reactances of the circuit. The capacitive reactance is



the inductive reactance is,

 

and the impedance Z of the circuit is

 

The current in the circuit is then

 



**ANS. FIG. P32.16**

(a) The maximum voltage between points *a* and *b* is the potential drop across the resistor:

 

(b) The maximum voltage between points *b* and *c* is the potential drop across the coil:

 

(c) The maximum voltage between points *c* and *d* is the potential drop across the capacitor:

 

(d) The potential drop between points *b* and *d* is

 

3. A series *RLC* circuit has components with the following values: *L =* 20.0 mH, *C* = 100 nF, *R* = 20.0 Ω, and Δ*V* max = 100 V, with Δ*ν* = Δ*V*max sin *ωt.* Find (a) the resonant frequency of the circuit, (b) the amplitude of the current at the resonant frequency, (c) the *Q* of the circuit, and (d) the amplitude of the voltage across the inductor at resonance.

**Ans:**

We are given *L* = 0.020 0 H, *C* = 100 × 10–9 F, *R* = 20.0 Ω, and 

(a) The resonant frequency for a series *RLC* circuit is

  

(b) At resonance,

 

(c) From Equation 32.43,

 

(d) At resonance, the amplitude of the voltage across the inductor is

 