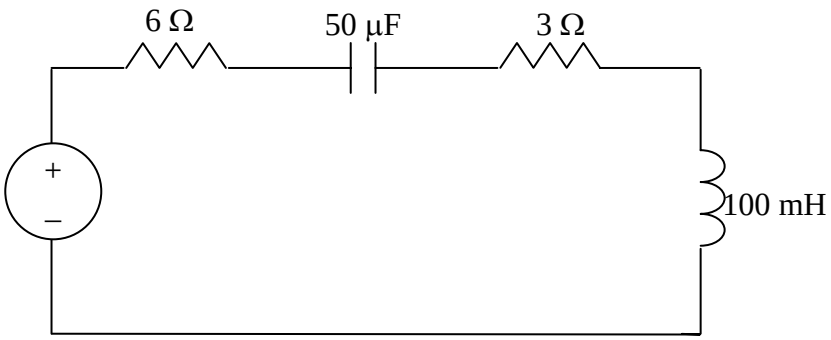
PS #19 Solutions

Chapter 14, Solution 26.

Consider the circuit as shown below. This is a series RLC resonant circuit.



R = 6 + 3 = 9 Ω

$$\omega_o = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{100x10^{-3}\,x50x10^{-12}}} = \underline{447.21 \text{ krad/s}}$$

$$Q = \frac{\omega_o L}{R} = \frac{447.21x10^3\,x100x10^3}{9} = \underline{4969}$$

$$B = \frac{\omega_o}{Q} = \frac{447.21x10^3}{4969} = \underline{90 \text{ rad/s}}$$

Chapter 14, Solution 28.

Let $R = 10\,\Omega$.

$$L = \frac{R}{B} = \frac{10}{20} = 0.5\ H$$

$$C = \frac{1}{\omega_0^2 L} = \frac{1}{(1000)^2 (0.5)} = 2\ \mu F$$

$$Q = \frac{\omega_0}{B} = \frac{1000}{20} = 50$$

Therefore, if $R = 10\,\Omega$ then

L = **0.5 H**, C = **2 μF**, Q = **50**

Chapter 14, Solution 30.

$$\omega_o = 2\pi(15,000) = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{(.01H)C}}$$

$$C = 11.26nF$$

At resonance, the circuit appears purely resistive so $I = \frac{V}{R} = \frac{120Vrms}{20\Omega} = 6Arms$

$$Q = \frac{\omega_o L}{R} = \frac{2\pi(15,000)(.01)}{20} = 47.12$$