

EEET-121 AC Circuits

Quiz #8 2185

Power and Series Resonance

Name (printed): * SOLUTIONS *

Program: _____

All 6 questions are equally weighted, there is no partial credit. Circle the correct answer for each question.

An electrical system is rated at 5 kVA, 120V (rms) with a 0.7 lagging power factor.
Determine the following:

1. The impedance of the system in rectangular coordinates

- a. $(1.73 - j2.30) \Omega$
b. $(2.30 + j1.73) \Omega$
c. $(1.73 - j2.30) \Omega$
d. $(2.02 + j2.06) \Omega$

ELI
(INDUCTIVE)

$$|S| = |V| \cdot |I|$$

$$5 \text{ kVA} = (120 \text{ V})(I)$$

$$I = 41.67 \text{ A}_{\text{rms}}$$

$$\theta = \cos^{-1}(0.7) = 45.57^\circ$$

$$\vec{V} = 120 \text{ V}_{\text{rms}} \angle 0^\circ$$

$$I = 41.67 \text{ A}_{\text{rms}} \angle -45.57^\circ$$

$$\vec{Z} = \frac{\vec{V}}{\vec{I}} = (2.02 + j2.06) \Omega$$

2. The average power delivered to this system

- a. 3500 W
b. 5000 W
c. 4000 W
d. 2250 W

$$P_{\text{AVE}} = I_{\text{rms}}^2 \cdot R$$

$$= (41.67 \text{ A}_{\text{rms}})^2 \cdot (2.02 \Omega)$$

$$= 3,500 \text{ W}$$

3. Is this system more inductive, capacitive or completely resistive?

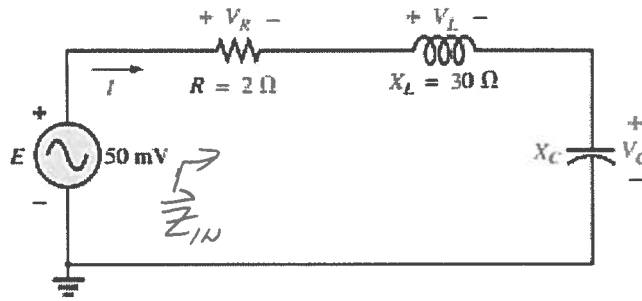
a. inductive

b. capacitive

c. resistive only

d. not enough information to tell

Questions 4 through 6 on the back →



Note: $E = 50 \text{ mVRMS} < 0^\circ$

For the circuit shown above, answer the following questions:

4. Find the total impedance of the circuit at resonance:

- a. $30 \Omega < 86^\circ$
- b. $28 \Omega < 86^\circ$
- c. $(2 + j0) \Omega$
- d. $(2 + j30) \Omega$

$$\vec{Z}_{T/N} = R = 2\Omega \quad (\text{AT } f_s)$$

5. What is the quality factor of the circuit?

- a. $Q_s = 0.067$
- b. $Q_s = 0$
- c. $Q_s = 25$
- d. $Q_s = 15$

$$Q_s = \frac{X_L}{R} = \frac{30\Omega}{2\Omega} = \boxed{15}$$

6. Find the power dissipated by the circuit at resonance:

- a. 25.0 mW
- b. 1.25 mW
- c. 1.56 mW
- d. 2.50 mW

$$\begin{aligned} P_o = P_R &= \frac{E^2}{R} \text{ @ RESONANCE} \\ &= \frac{(50 \text{ mV})^2}{2\Omega} \\ &= \boxed{1.25 \text{ mW}} \end{aligned}$$