

NAME (printed): X SOLUTIONS *

All 6 questions are equally weighted, no partial credit will be awarded. Circle the correct answer.

1. What is the effective (or rms) voltage of $v(t) = 10 \sin(\omega t - 50^\circ)$?

a. 7.07 V
b. 10 V
c. 14.14 V
d. 20 V

$$10 \text{ Vpk} \left(\frac{1}{\sqrt{2}} \right) = \underline{7.07 \text{ V}_{\text{RMS}}}$$

2. What is the inductive reactance at 800 Hz of a 1 mH inductor?

a. 0.2 Ohms
b. 5.0 Ohms
c. 12 Ohms
d. 20 Ohms

$$X_L = 2\pi fL = 2\pi(800)(1 \text{ mH}) \\ = \underline{5.03 \Omega}$$

3. At what frequency does a 10 μF capacitor have a reactance of 100 Ohms?

a. 159 Hz
b. 1.59 kHz
c. 15.9 kHz
d. 1.59 MHz

$$X_C = \frac{1}{2\pi fC} \quad \therefore f = \frac{1}{2\pi(100\Omega)(10\mu\text{F})} \\ f = \underline{159.2 \text{ Hz}}$$

4. If the voltage $v(t) = 50 \sin(500t - 75^\circ)$ is impressed across a 25 Ohm resistor, which equation describes the resistor current?

a. $2 \cos(500t - 75^\circ)$
b. $2 \sin(20t - 3^\circ)$
c. $2 \sin(500t - 75^\circ)$
d. $1250 \sin(500t - 75^\circ)$

$$i(t) = \frac{v(t)}{R} = \frac{50 \sin(500t - 75^\circ)}{25} = 2 \sin(500t - 75^\circ) \text{ A}$$

5. The voltage across a 100 mH coil is $v(t) = 100 \sin(50t)$. Which of these expressions describes the current?

a. $2000 \sin(50t - 90^\circ)$
b. $20 \sin(50t + 90^\circ)$
c. $20 \sin(50t - 90^\circ)$
d. $20 \sin(50t)$

$$i(t) = \frac{V_{\text{M}}}{X_L} \sin(50t - 90^\circ) \quad \begin{matrix} I \text{ LAGS } V \\ \text{For "L"} \end{matrix} \\ = \underline{20 \sin(50t - 90^\circ) \text{ A}}$$

6. How much power is dissipated (average power) by a resistor if the current through it is $i(t) = 10 \sin(\omega t + 30^\circ)$ and the voltage across it is $v(t) = 50 \sin(\omega t + 30^\circ)$?

a. 5 W
b. 250 W
c. 353.5 W
d. 500 W

$$P_{\text{ave-R}} = (V_{\text{RMS}})(I_{\text{RMS}}) = \left(\frac{10 \text{ V}}{\sqrt{2}} \right) \left(\frac{50 \text{ A}}{\sqrt{2}} \right) \\ = \underline{250 \text{ W}}$$