

生機系電工學第六次練習 ANS 2012/04/25

學號：_____ 姓名：_____

1. What is the phase relationship between the following pairs of waveforms?

$$v(t) = 12 \sin(400t - 72^\circ) \quad i(t) = 0.4 \sin(400t - 16^\circ)$$

- i(t) leads v(t) 88° v(t) leads i(t) 88° i(t) leads v(t) 56° v(t) leads i(t) 56°
 i(t) lags v(t) 88° v(t) lags i(t) 88° i(t) lags v(t) 56° v(t) lags i(t) 56°
 以上皆非

2. Write the sinusoidal expression for each quantity using the information provided

$$I_{\text{eff}} = 36 \text{ mA}, f = 1 \text{ kHz}, \text{ phase angle} = 60^\circ$$

$$i(t) = 50.9 \times 10^{-3} \text{ A} \sin(6283.2t + 60^\circ)$$

$$V_{\text{eff}} = 8 \text{ V}, f = 60 \text{ Hz}, \text{ phase angle} = -10^\circ$$

$$v(t) = 11.31 \text{ V} \sin(377t - 10^\circ)$$

3. Write the sinusoidal expression for a current $i(t)$ that has a peak value of $6 \mu\text{A}$ and leads the following voltage by 40° . $v(t) = 16 \sin(1000t + 6^\circ)$

$$\text{答案： } i(t) = 6 \times 10^{-6} \sin(1000t + 46^\circ) \text{ A}$$

4. Find the sinusoidal expression for the voltage drop across a 20-mH coil if the current i_L is $4 \cos(500t - 30^\circ)$ 4%

$$v(t) = 40 \text{ V} \sin(500t + 150^\circ)$$

5. Determine the sinusoidal expression for the current i_c of a 10- μF capacitor if the voltage across the capacitor is $V_c = 20 \times 10^{-3} \sin(2000t + 30^\circ)$ 4%

$$i(t) = 0.4 \text{ mA} \sin(2000t + 120^\circ)$$

6. For the following pairs determine whether the element is a resistor, inductor, or capacitor, and determine the resistance, inductance, or capacitance.

$$v(t) = 16 \sin(200t + 80^\circ) \text{ V} \quad i(t) = 0.04 \sin(200t - 10^\circ) \text{ A}$$

resistor resistance = _____ Ω

inductor inductance = 2 H

capacitor capacitance = _____ F

$$\text{電壓領先電流 } 90^\circ, \text{ 故為電感。 } X_L = \omega L = \frac{V_m}{I_m} = \frac{16}{0.04} = 400 \Omega \quad L = \frac{X_L}{\omega} = \frac{400}{200} = 2 \text{ H}$$

7. For the following pairs determine whether the element is a resistor, inductor, or capacitor, and determine the resistance, inductance, or capacitance.

$$v(t) = 0.12 \sin(1000t + 10^\circ) \text{ V} \quad i(t) = 6 \times 10^{-3} \cos(1000t + 10^\circ) \text{ A}$$

resistor resistance = _____ Ω

inductor inductance = _____ H

capacitor capacitance = 50 μ F

$$i(t) = 6 \times 10^{-3} \cos(1000t + 10^\circ) \text{ A} = 6 \times 10^{-3} \sin(1000t + 100^\circ) \text{ A}$$

電流領先電壓 90° ，故為電容。 $X_C = \frac{1}{\omega C} = \frac{V_m}{I_m} = \frac{0.12}{6 \times 10^{-3}} = 20\Omega$

$$C = \frac{1}{X_C \omega} = \frac{1}{20 \times 1000} = 50\mu\text{F}$$

8. For the following pairs determine the real power delivered to the load, find the power factor.

$$v(t) = 100 \text{ V } \sin(10^6 t - 10^\circ) \quad i(t) = 0.2 \text{ A } \cos(10^6 t - 40^\circ) \quad 4\%$$

Real power = 5W Power factor = 0.5 (lagging leading)