

生機系電工學第八次隨堂測驗 2011/05/04 解答

學號：

姓名：

1. For the following pairs determine the power delivered to the load, find the power factor, and indicate whether it is a resistor, inductor, or capacitor.

Determine the resistance, inductance, or capacitance.

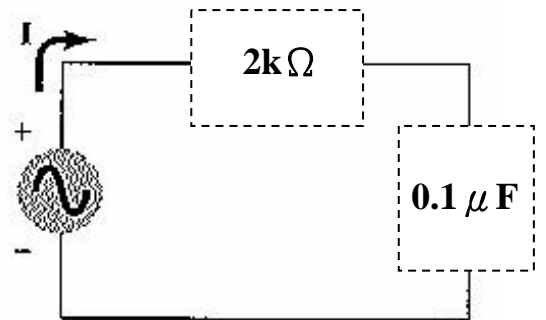
$$v(t) = 100 \sin(10^6 t - 10^\circ) \text{V} \quad i(t) = 0.2 \sin(10^6 t - 40^\circ) \text{A}$$

$$\text{Power } P = V(j\omega)I(j\omega) \cos \theta = \frac{100\text{V} \cdot 0.2\text{A}}{2} \cos 30^\circ = 8.66\text{W}$$

$$\text{Power factor } F_p = \cos 30^\circ = 0.866 \quad \text{Lagging}$$

負載非純電阻，也非純電感。負載的電感性高於電容性，是一具有電感特徵的負載。

2. 圖示電路的電壓源 $v(t) = 169.706 \sin(1000t)$ 、電流 $i(t) = 16.639 \times 10^{-3} \sin(1000t + 78.69^\circ)$ 。請問電路上兩個未知元件分別為何？其電阻值？或電感值？或電容值？請把元件符號畫上去，並把電阻值或電感值或電容值標上去【注意單位，沒有標示單位不予計分】



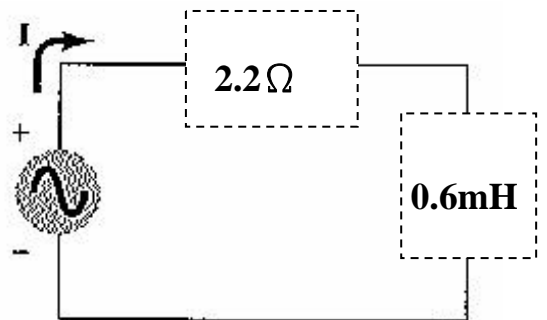
$$V(j\omega) = 120 \angle 0^\circ, \quad I(j\omega) = 11.767 \times 10^{-3} \angle 78.69^\circ$$

$$Z_T = \frac{V(j\omega)}{I(j\omega)} = \frac{120 \angle 0^\circ}{11.767 \times 10^{-3} \angle 78.69^\circ}$$

$$= 10.198 \times 10^3 \angle -78.69^\circ = 2 \times 10^3 - j10 \times 10^3 = R - jX_C$$

$$X_C = \frac{1}{\omega C} = 10 \times 10^3 \quad C = 0.1 \mu\text{F}$$

3. 圖示電路的電壓源 $v(t) = 84.853 \sin(1000t)$ 、電流 $i(t) = 37.22 \sin(1000t - 15.26^\circ)$ 。請問電路上兩個未知元件分別為何？其電阻值？或電感值？或電容值？請把元件符號畫上去，並把電阻值或電感值或電容值標上去【注意單位，沒有標示單位不予計分】



$$V(j\omega) = 60 \angle 0^\circ, \quad I(j\omega) = 26.3185 \angle -15.26^\circ$$

$$Z_T = \frac{V(j\omega)}{I(j\omega)} = \frac{60 \angle 0^\circ}{26.3185 \angle -15.26^\circ}$$

$$= 2.28 \Omega \angle 15.26^\circ = 2.2 \Omega + j0.6 \Omega = R + jX_L$$

$$X_L = \omega L = 0.6 \Omega \quad L = 0.6 \text{ mH}$$