# 電路學期末考 2002/1/18

1. Assume a value for $\underline{I}_1$ in Fig.1 to calculate $\frac{\underline{V}_1}{\underline{V}}$ (15%) and $\frac{\underline{V}}{\underline{I}}$ (15%) in polar form when R=6Ω and $\underline{I}_X = 2\underline{I}_1$.

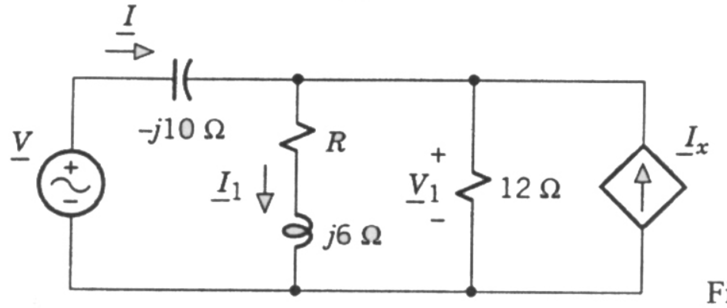


Fig. 1

2. For the circuit shown in Fig.2, find $i_1$, $i_2$ and $v_a$ using mesh analysis. (15%)

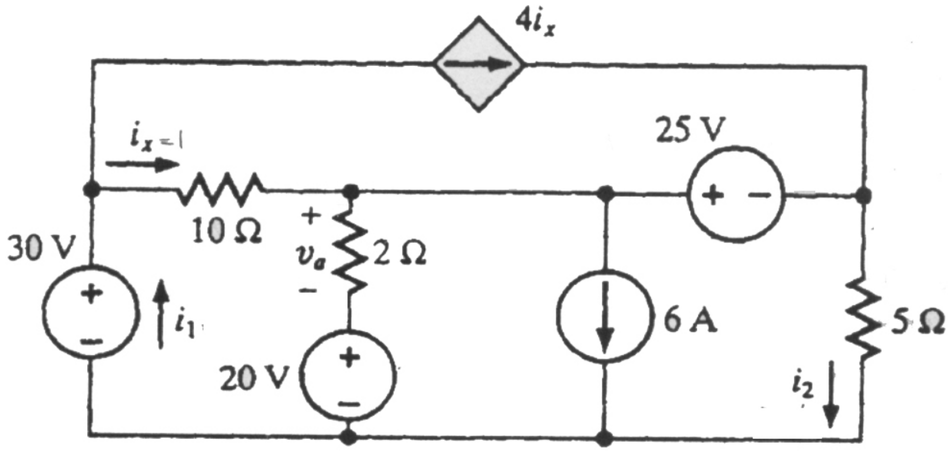


Fig. 2

3. The circuit shown in Fig.3 has two loads and a switch. (a). When the switch is open (i.e., not connected), $\underline{I} = 100A(rms)\angle 0^\circ$. Find the real power and power factor of load #1. (10%) (b). When the switch is closed, $\underline{I} = 125A(rms)\angle -30^\circ$. Find the reactive power of load #2. (5%)

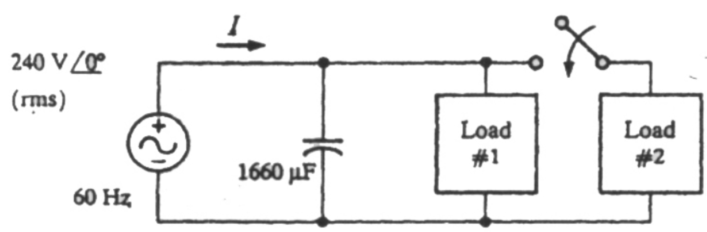


Fig. 3

4. For the circuit shown in Fig.4 and

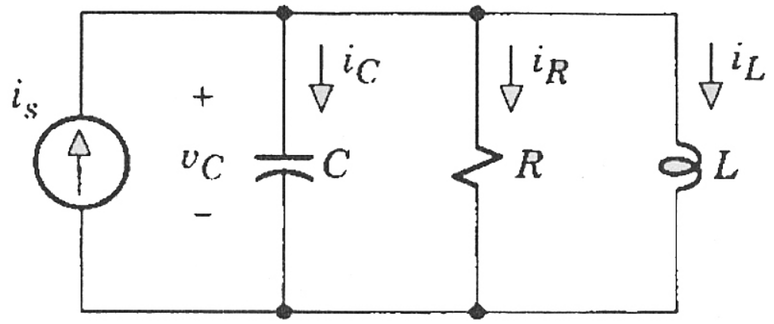


Fig. 4

(a) Show that critical damping in a parallel CRL circuit corresponds to $Q_{par}=0.5$, where $Q_{par}$ is the quality factor for parallel resonance. (6%)

(b) Find expressions for the initial value and slope at $t=0^+$ for $v_c$, $i_c$ and $i_L$ in Fig.4 when

$$i_s = \begin{cases} I_1 & ,t<0 \\ I_2 & ,t>0 \end{cases} \quad (6\%)$$

(c) Find the transient response of $i_L$ when $R=3\Omega$, $C=\frac{1}{24}F$, $L=2H$, and

$$i_s = \begin{cases} 2\,A & ,t<0 \\ -1\,A & ,t>0 \end{cases} \quad (6\%)$$

(d) Suppose that $C=\frac{1}{24}F$, $L=2H$, determine the three different ranges of R $(R\geq 0)$ in which overdamping, critical damping, and underdamping occur. (3%)

(e) Explain why the natural responses of $i_c$ and $i_R$ satisfy the same second order differential equation as $i_L$. (3%)

5. For the circuit shown in Fig.5, find $i(t)$ for t>0 given that $i_s(t)=4\cos 10t$ A. (16%)

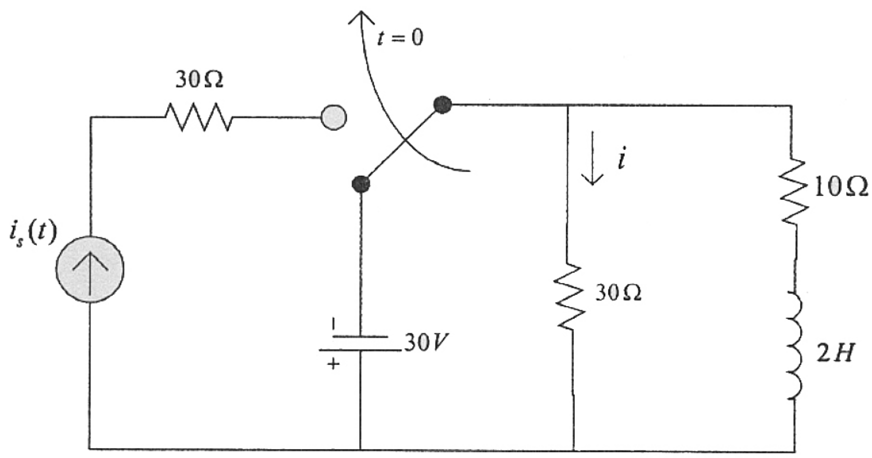


Fig. 5