

國立臺灣科技大學 105 年度電力電子產業碩士專班招生(秋)試題
 系所組別：電力電子領域
 科目：電路學

(總分為 100 分)

不得使用計算器

1. Given the circuit in Fig. P1, calculate the currents i_1 through i_4 . (16 分)

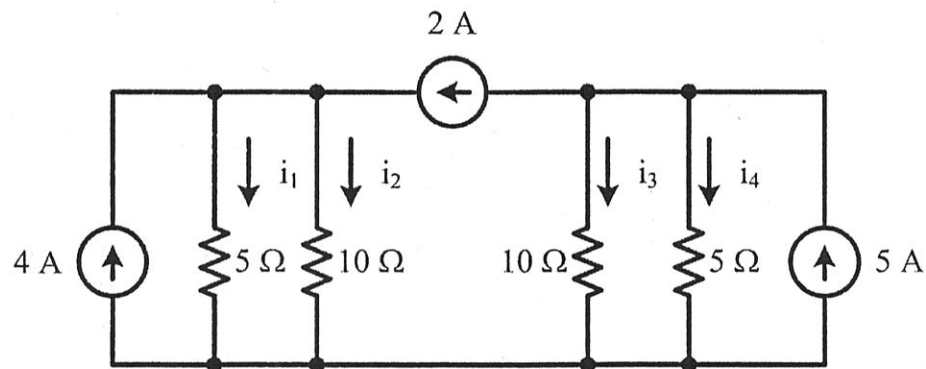


Fig. P1

2. The circuit in Fig. P2 represents an unbalanced bridge. Find the current i . (20 分)

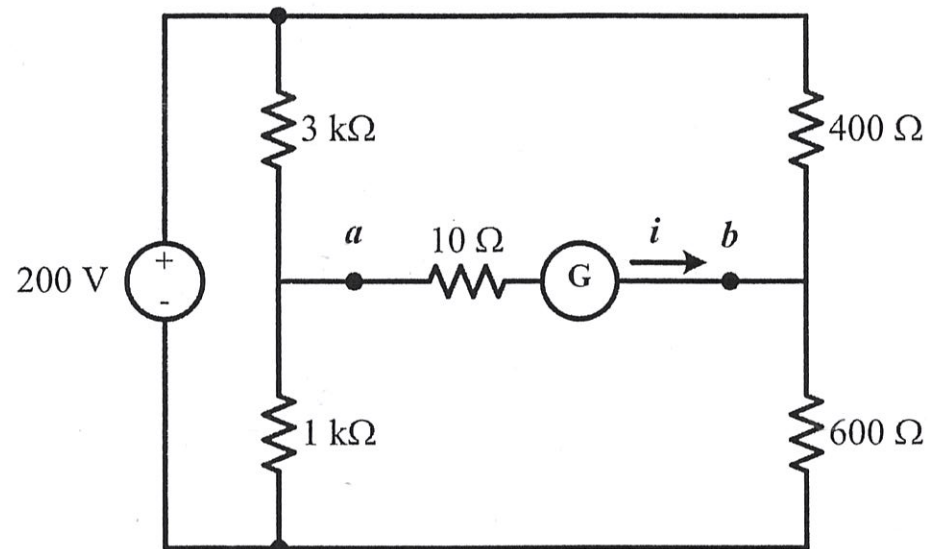


Fig. P2

3. As shown in Fig. P3, the spark coil of an automobile ignition system has a 20-mH inductance and a 5Ω resistance. With a supply voltage V_s of 12 V, calculate
- The time needed for the coil to fully charge (5 分)
 - The energy stored in the coil (4 分)
 - The voltage developed at the spark gap if the switch opens in $2 \mu\text{s}$ (5 分)

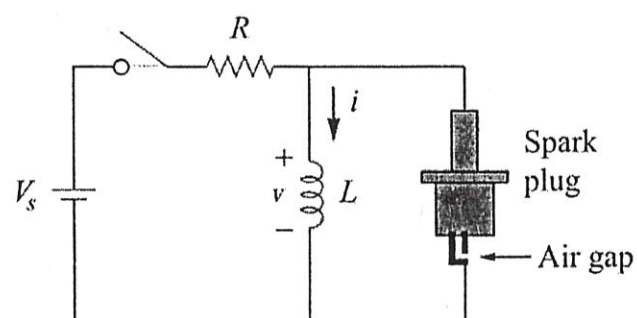
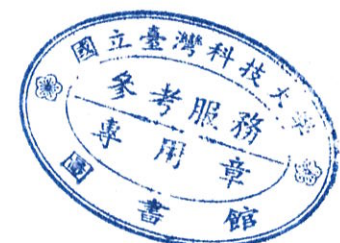


Fig. P3



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4. Determine the voltage $v_o(t)$ across the $8\ \Omega$ resistor in the circuit of Fig. P4. (10 分)

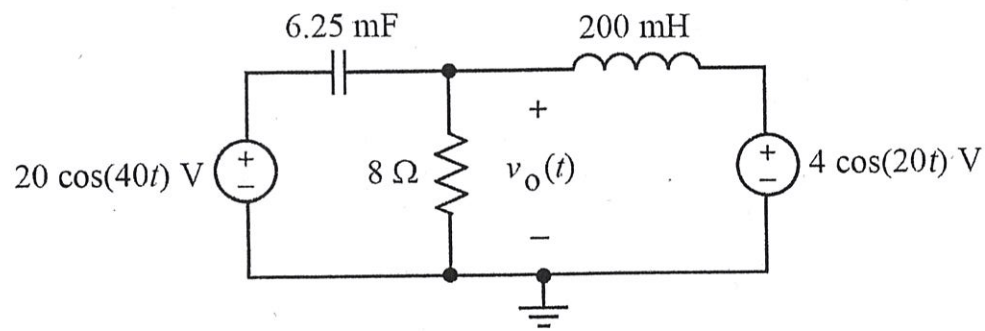


Fig. P4

5. In Fig. P5, the voltage source $V = 120\angle 90^\circ\ \text{V}_{\text{rms}}$, and $I = \sqrt{2}\angle 45^\circ\ \text{A}_{\text{rms}}$. The first load draws complex power $S_1 = 60 + j40\ \text{VA}$. Calculate I_1 , I_2 and the total power factor of the circuit. (note: I_1 , I_2 can be represented as rectangular form) (15 分)

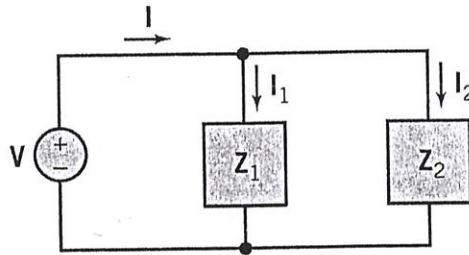


Fig. P5

6. In Fig. P6 shows a circuit with a mutual inductance. Find the voltage V_2 if $\omega = 5000$. (10 分)

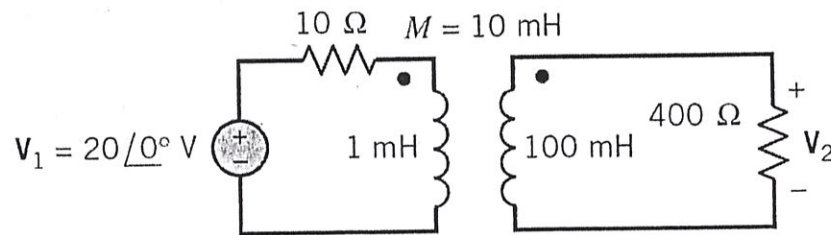


Fig. P6

7. (a) Determine the phasor corresponding to the sinusoid $i(t) = 100\sin(400t - 75^\circ)$. (5 分)
 (b) Find the effective value of $i(t) = \sin 400t + \cos(400t - 30^\circ)$. (5 分)
 (c) Find the inverse Laplace transform of $F(s) = \frac{4}{(s+1)^2(s+2)}$. (5 分)

