國立臺灣科技大學 101 年度電力電子產業碩士專班招生(春)試題

系所組別：電力電子領域

科　　目：電路學

(總分爲 100 分)　　不得使用計算器

1. For the circuit shown in Fig. 1, please find v_a, i_1, and i_2. (15 分)

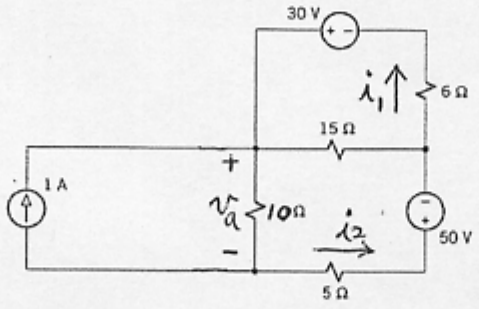

Fig. 1

2. Fig. 2 shows a first-order circuit without input source, thus only natural response is considered.

(a) Given $R = 2\Omega$, $C = 2F$, please derive a differential equation corresponding to the capacitor voltage $v_N(t)$. (10分)

(b) If $v_N(0) = 10$ V, please find the natural response of $v_N(t)$. (5分)

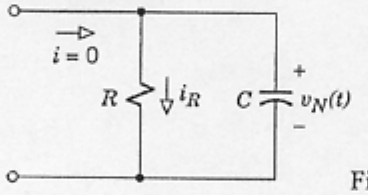

Fig. 2

3. Two ac loads are supplied by an ac source with line voltage 500V(rms) at 60Hz, as shown in Fig. 3. The real power and power factor of each load are given.

(a) Please find the apparent power for these two loads respectively. (8分)

(b) Please find the rms values of the two load currents respectively. (8分)

(c) Find the total power factor for the ac source. (4分)

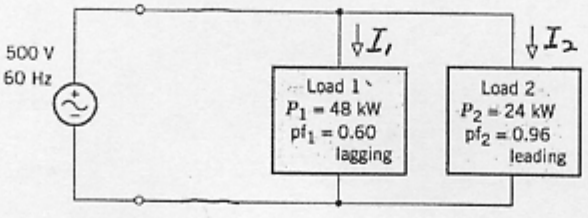

Fig. 3

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4. For the circuit shown in Fig. 4, find voltage v_o (10 分)

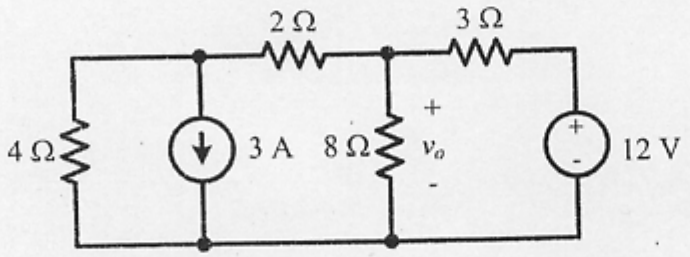

Fig. 4

5. For the ideal transformer circuit of Fig. 5, find: (共 20 分)
   (a) the source current I_1 (7分)
   (b) the output voltage V_o, and (7分)
   (c) the apparent power supplied by the source. (6分)

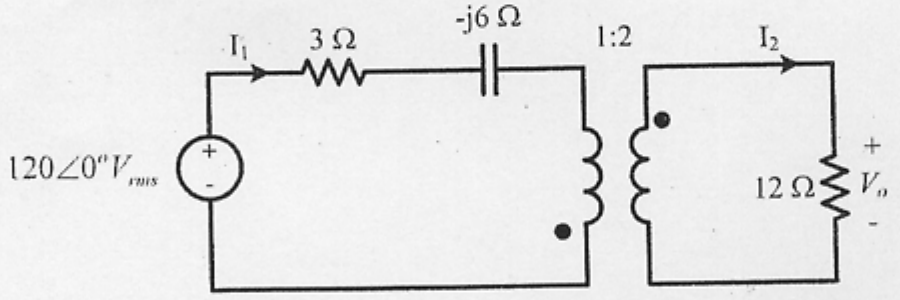

Fig. 5

6. For the compensation circuit shown in Fig. 6, find the transfer function $\frac{V_o(s)}{V_i(s)}$ (20 分)

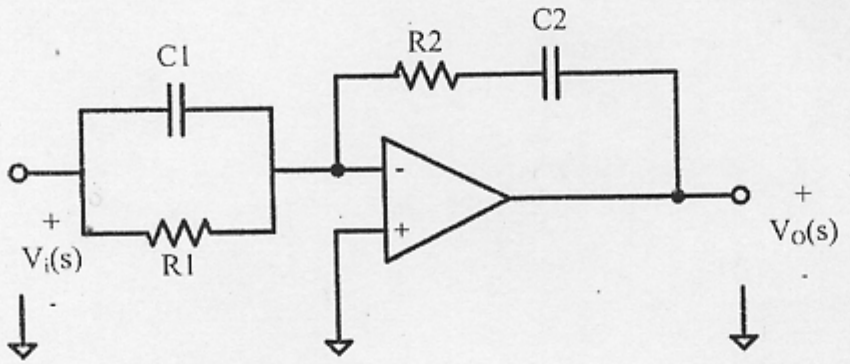

Fig. 6