

國立臺灣科技大學
八十八學年度碩士班招生考試試題

系所別：電機工程系碩士班

組別：甲組

科目：電路學

1. Use the ideal op-amp model to determine the functional relationship between voltage v and current i , $v = f(i)$ for the network shown in Fig.1, if the functional relationship between v_L and i_L is

$$v_L = g(i_L)$$

$$\text{or } i_L = g^{-1}(v_L)$$

What is the equivalent circuit connected between terminal a and b in the circuit if the load is an inductance of the value L ? (15%)

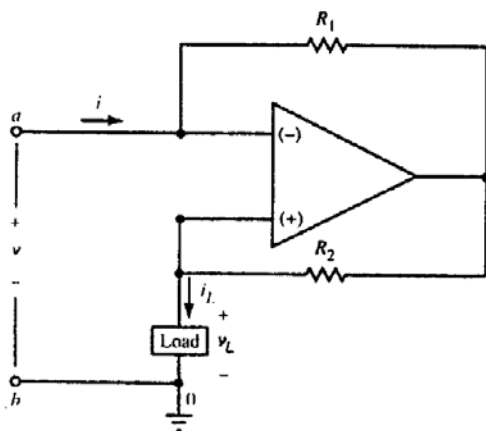


Fig. 1

2. Determine i_o for the network shown in Fig.2. (10%)

5.

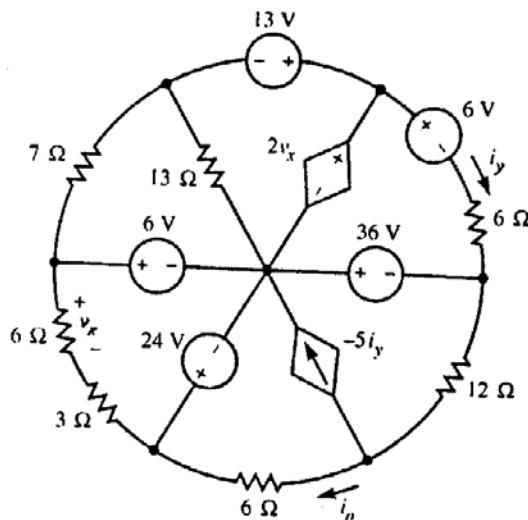


Fig. 2

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3. In the network in Fig.3, switch 1 has been open for a very long time, switch 2 has been closed for a very long time, and switch 1 is closed at $t = 0$. Find:
- $v_1(0^-)$, $i_1(0^-)$, $v_2(0^-)$, $i_2(0^-)$. (5%)
 - $v_1(0^+)$, $i_1(0^+)$, $v_2(0^+)$, $i_2(0^+)$. (5%)
 - $v_1(\infty)$, $i_1(\infty)$, $v_2(\infty)$, $i_2(\infty)$. (5%)
 - The complete response for $v_1(t)$ when $t > 0$. (10%)

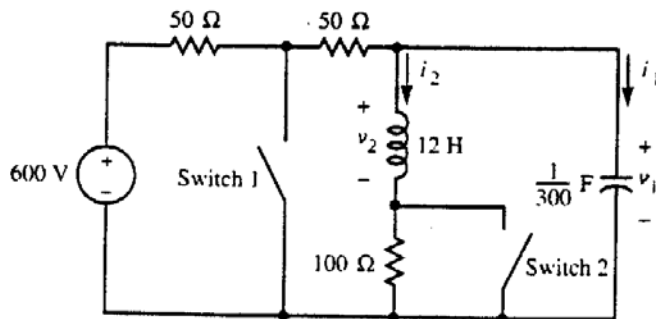
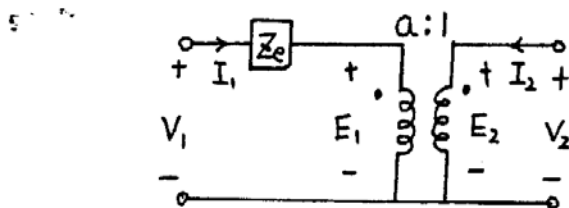


Fig. 3

4. Construct a Bode plot for a high-pass RL filter with inductor voltage as the output. (15%)
5. For the simplified transformer model with all impedance referred to the primary side and the complex turns ratio of $a : 1$, find the current ratio and the node admittance matrix \mathbf{Y}

where

$$\begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} y_{11} & y_{12} \\ y_{21} & y_{22} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} \quad (15\%)$$



6. Two balanced three-phase loads are connected to a 440-V three-phase line. One load draws 60 kW at a power factor of 0.6 lagging and the other draws 75 kVA at a power factor of 0.8 leading. What line current is required to supply the combined load? (20%)