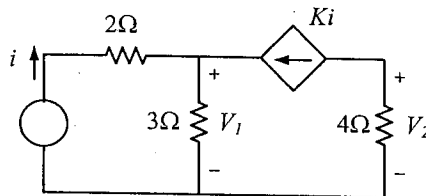


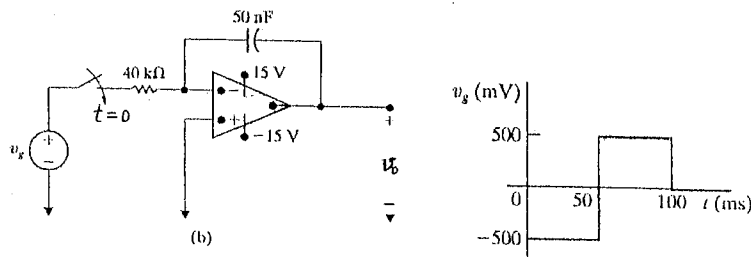
科目：電路學(5009)

校系所組：清華大學電機工程學系(甲組)

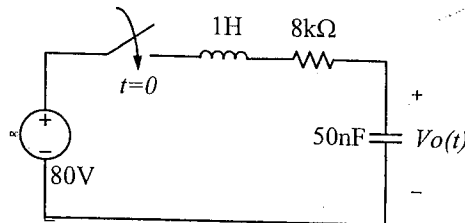
- 一、 For the circuit shown below, $K=7$ and V_1 is measured to be 6 V.
- (一) (6%) What is the value of V_2 ?
 - (二) (2%) Assume that the ideal source on the left is a current source. What is its value?
 - (三) (2%) If the ideal source is a voltage source, what is its value?



- 二、 For the following circuit, assume that the initial voltage value of the OpAmp output terminal is zero. Please find the expression of v_o for $t > 0$. (5%)

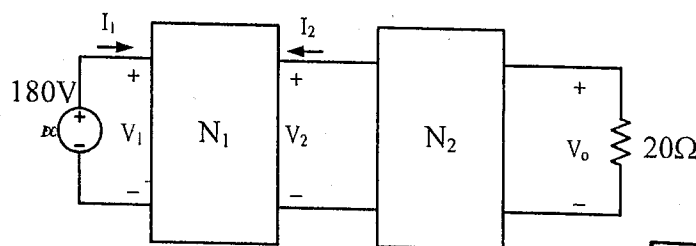


- 三、 Suppose that the initial energy stored in the following circuit is zero.
- (一) (5%) Please find the expression of v_o after the switch is closed.
 - (二) (2%) What are the steady-state values of the voltages across the inductor and the capacitor?
 - (三) (8%) If the voltage source is not 80 V, but $80+40\cos(40t)$ V, what will the steady-state value of v_o become?



- 四、 (10%) Two identical networks, N_1 and N_2 , are connected in cascade as given. Each network is described in terms of its h parameters. The values are $h_{11}=2\Omega$, $h_{12}=1.0$, $h_{21}=-1.0$, $h_{22}=4S$. Find the output voltage V_o .

$$\begin{bmatrix} V_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} \begin{bmatrix} I_1 \\ V_2 \end{bmatrix}$$

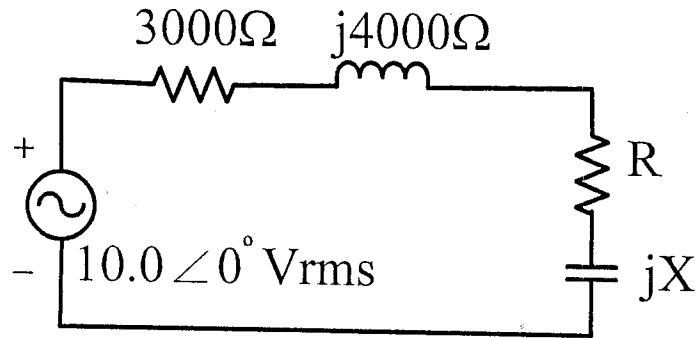


注意：背面有試題

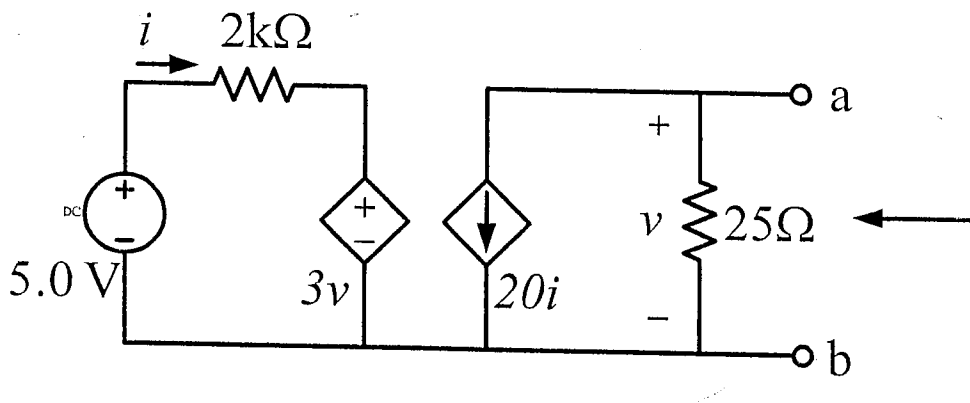
科目：電路學(5009)

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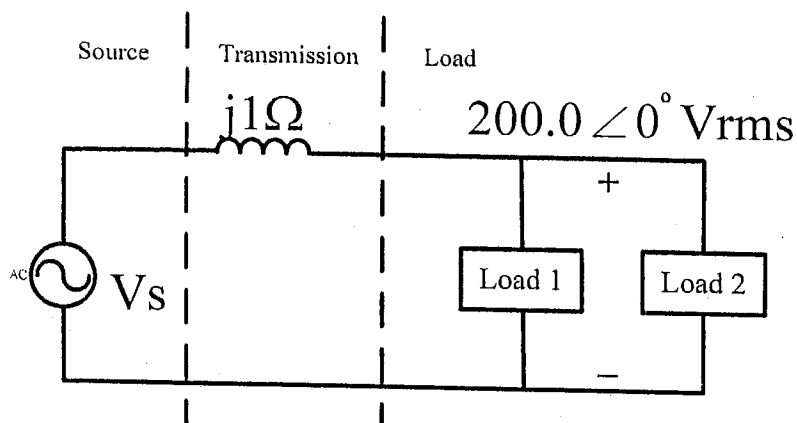
- 五、 (10%) In the following circuit, assume that the load resistance can be varied between 0 and 4000Ω and that the capacitive reactance can be varied between 0 and -2000Ω . What settings of R and X transfer the most average power to the load? What is the maximum average power that can be transferred under these restrictions?



- 六、 (10%) Find the Thevenin's equivalent for the following circuit



- 七、 In the given circuit, the voltage across Load 1 and Load 2 is $200V(\text{rms})$. Load 1 consumes 15kVA at $\text{pf}=0.6$ (lagging) and Load 2 consumes 6kVA at $\text{pf}=0.8$ (leading) respectively. Assume the power consumption of these two loads is not affected by the applied voltage. The transmission line is represented by $j1\Omega$, the line losses do exist, but are neglected for simplification.
- (一) (5%) Find the source voltage V_s (in rms);
- (二) (5%) Assume V_s is fixed. You are asked to raise the load terminal voltage as much as possible without sacrificing the transmission efficiency. However, only load terminals are accessible to you, and only passive components are available for your task. Please describe your approach and validate it with analysis and calculations.



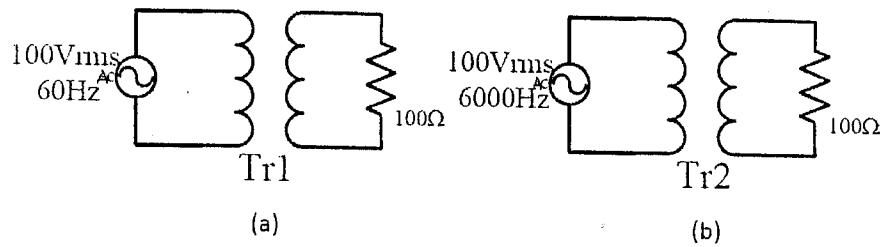
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八、 Please answer the following questions.

(一) (5%) What are the differences between the mutual flux and the leakage flux?

(二) (5%) You are asked to build the transformers Tr1 and Tr2 in case (a) and case (b) to deliver the same amount of average power to the 100 ohm load resistors. Which transformer can be smaller in size? Please explain why.



九、 Please answer the following questions. Show all works.

(一) (4%) Explain in detail, what is the physical meaning in calculating the Fourier coefficients of a time-domain periodic waveform?

(二) (6%) Derive the Fourier coefficients for a periodic function expressed as $f(t) = \begin{cases} \sin(\frac{2\pi t}{T}), & 0 \leq t \leq T/2 \\ 0, & T/2 \leq t \leq T \end{cases}$

十、 (10%) Find out the output voltage $v_o(t)$ for the circuit below using Laplace transform. Show all works.

