

Homework 3

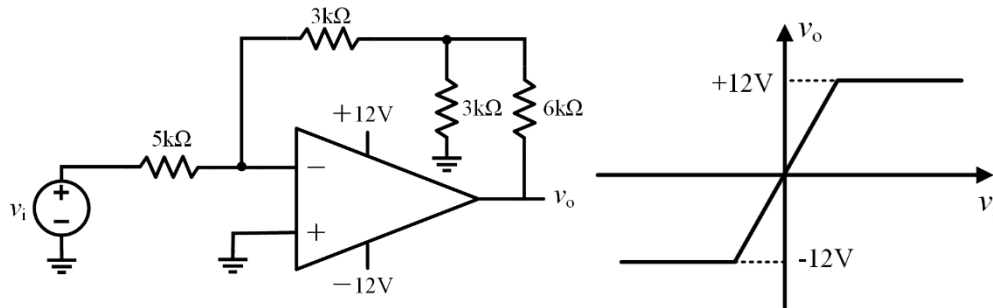
Due date: Nov. 7th, 2023

Turn in your hard-copy hand-writing homework in class

Rules:

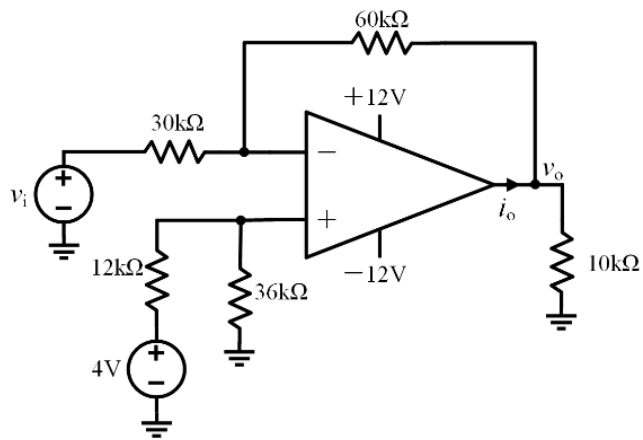
- Work on your own. Discussion is permissible, but extremely similar submissions will be judged as plagiarism.
- Please show all intermediate steps: a correct solution without an explanation will get zero credit.
- Please submit on time. No late submission will be accepted.
- Please prepare your submission in English only. No Chinese submission will be accepted.

1. The output voltage range of the operational amplifier is $[-12, 12]$, as shown below.
- If the operational amplifier is operated in the linear region, calculate v_o/v_i .
 - If the operational amplifier is operated in the linear region, determine the range of v_i

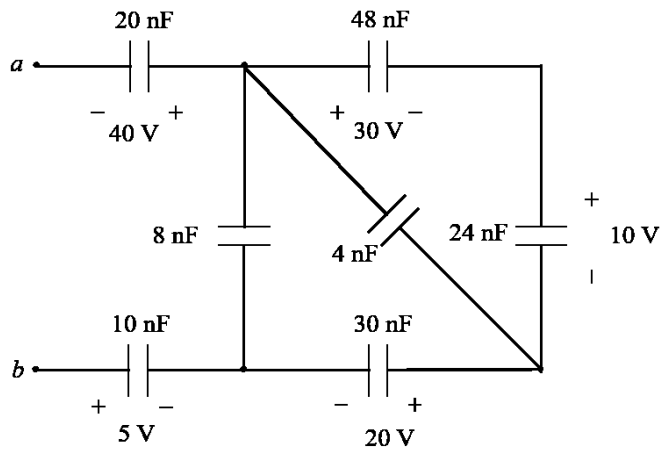


2. Given the circuit below.

- Draw the curve of v_o as a function of v_i and write down the derivation process.
- When v_i is 9 V, find i_o .



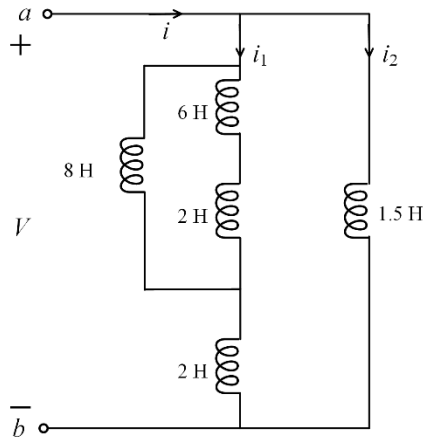
3. The capacitance and associated voltage for each capacitor is given as below. Find the equivalent capacitance C_{ab} and the voltage V_{ab} for the circuit below.



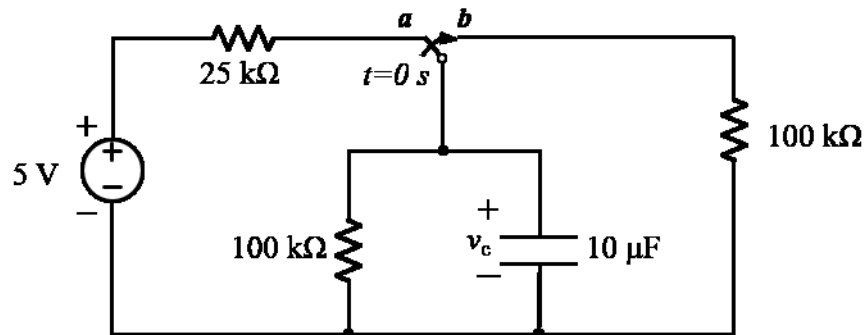
4. For the circuit below, $i(t=0) = 0$ A, $V = 6e^{-2t}$ V. The initial energy of all inductance are all 0.

a. Calculate the equivalent inductance L_{ab} .

b. Find the $i(t)$ for $t > 0$.



5. For the circuit below, when $t = 0s$, the switch was switched from node a to node b immediately. Assume that the circuit reaches steady state before $t = 0$. Determine the expression for $v_c(t)$ and $i_c(t)$ for $t \geq 0s$.



- 6.
- Assuming that Switch K have been closed for a long time, K opens at $t=0$, calculate the inductance current for $t > 0$.
 - For $t > 0$, calculate the total energy dissipated by the 2-ohm resistor.

