

Homework 3

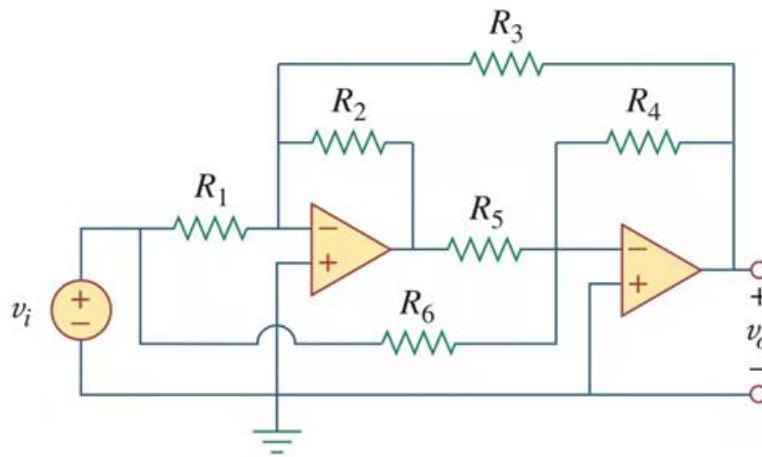
Due time: 18:30 on Oct. 28th, 2021

Turn in your homework in class or to tutorial classroom (1B110)

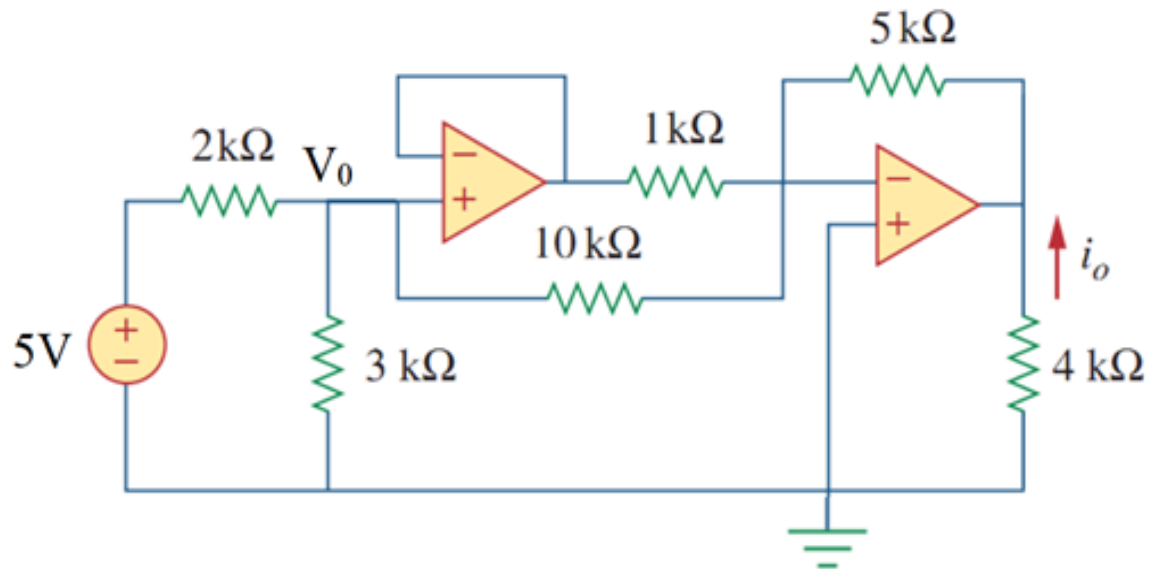
Rules:

- 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.
- If needed, round the number to the nearest hundredths, i.e., rounding it to 2 decimal places.

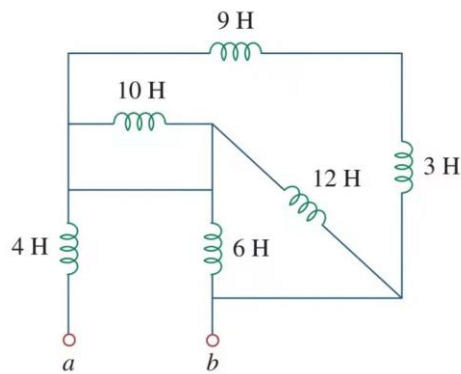
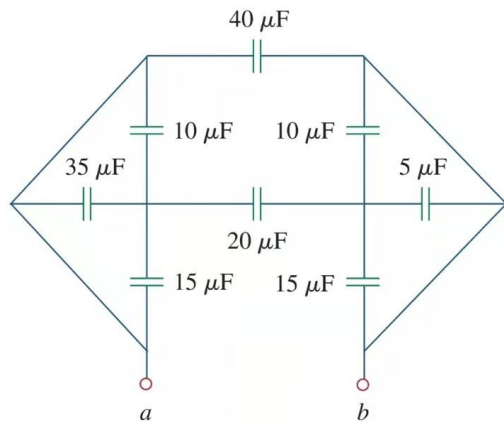
1. For the circuit below, assume the operational amplifiers are both working in their linear mode, determine the gain v_o/v_i of the circuit using resistance R_1 to R_6 .



2. For the circuit below, assume the operational amplifiers are both working in their linear mode,
- (1) Calculate V_0 in the op amp circuit.
 - (2) Calculate i_o in the op amp circuit.



3. Find equivalent capacitance C_{ab} and inductance L_{ab} for the following two networks:



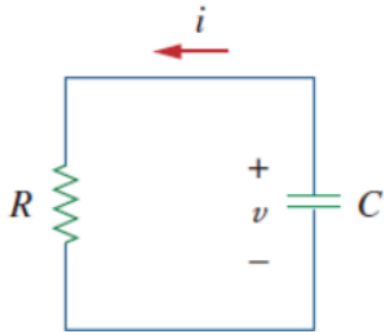
4. For the circuit below

$$v(t) = 5e^{-50t}V, \quad t > 0$$

$$i(t) = 150e^{-50t}mA, \quad t > 0$$

(1) Find R and C in the circuit.

(2) Calculate the energy dissipated on R during the time slot of $0 < t < 0.1s$

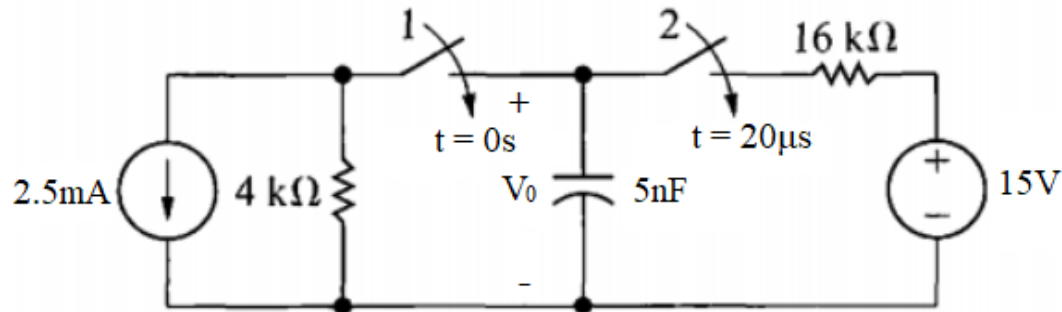


5. For the circuit below:

There is no energy stored in the capacitor in the circuit before $t = 0$ s.

When $t = 0$ s, Switch 1 is closed. When $t = 20\mu\text{s}$, Switch 2 is closed.

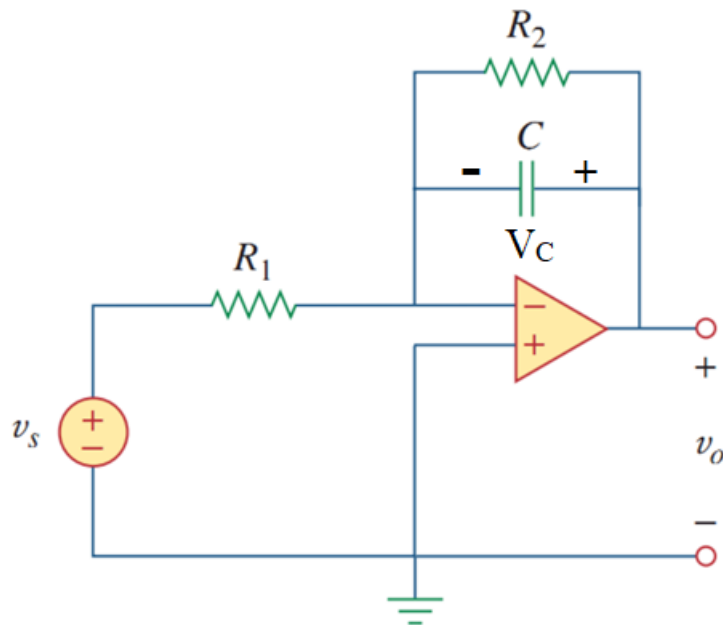
Find $V_0(t)$ for $t \geq 0$.



6. For the circuit below. assume the operational amplifier is always working in its linear mode, $V_C(0^-) = 5\text{V}$, $R_1 = 10\text{k}\Omega$, $R_2 = 500\Omega$, $C = 10\mu\text{F}$

$$V_s(t) = \begin{cases} 0, & t \leq 0 \\ e^{-200t}, & t > 0 \end{cases}$$

Find output voltage of the Op Amp $V_o(t)$ for $t > 0$.



7. For the circuit below:

The switch in the circuit has been in *position a* for a long time.

At $t = 0$ s, it moves instantaneously to *position b*, where it remains for 5 s before moving instantaneously to *position c*.

Find the expressions for $V_0(t)$ for $t \geq 0$.

