

Homework 3

Due date:

Mar.31st, 2021

Turn in your homework in class

Rules:

- Please 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. [8%] Find v_C , i_L and the energy stored in the capacitor and inductor in the circuit of Fig.1 under dc conditions.

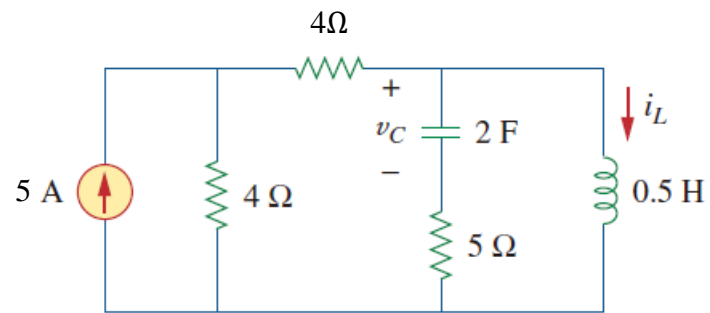


Fig. 1

2. [8%] In the circuit shown in Fig.2

$$v(t) = 50e^{-80t}V, \quad t > 0$$

$$i(t) = 12e^{-80t}mA, \quad t > 0$$

- Find the values of R and C .
- Calculate the time constant τ .
- Determine the energy dissipated on the capacitor in the period of $0 < t < 1s$.

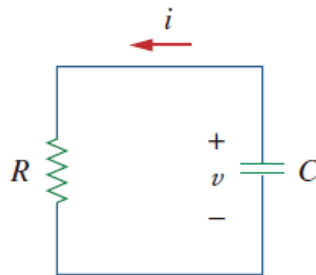


Fig. 2

3. [10%] Assuming that the switch in Fig.3 has been in position A for a long time and is moved to position C at $t = 0$, Then at $t = 2\text{s}$, the switch moves from C to B . Find $v_C(t)$ for $t \geq 0$.

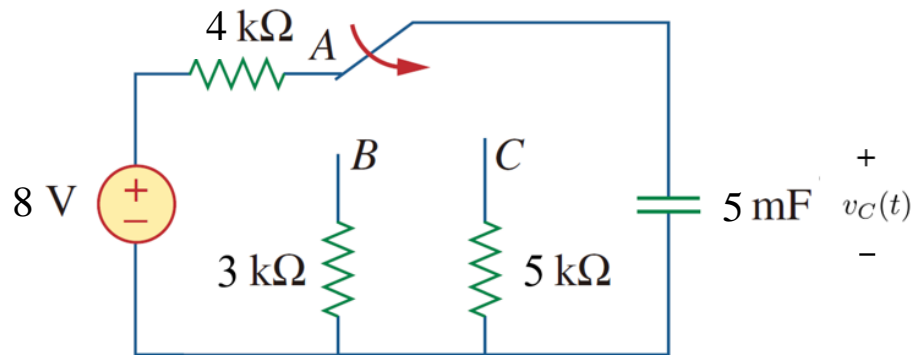


Fig. 3

4. [10%] Determine $v(t)$ for $t > 0$ in the circuit of Fig.4 if $v(0_-) = 0$.

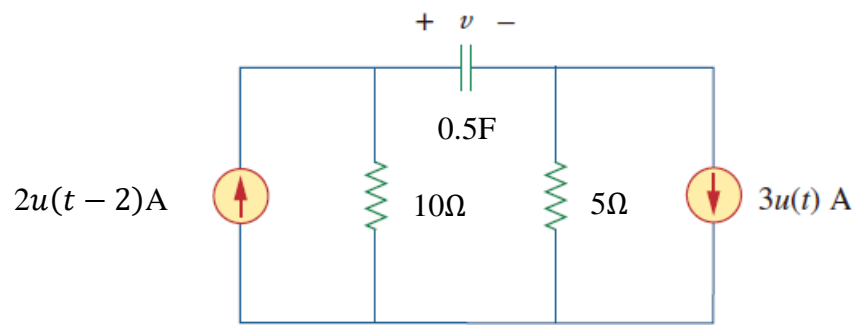


Fig. 4

5. [10%] Assume that the switch has been closed for a long time, find $i(t)$ for $t > 0$ in the circuit of Fig.5.

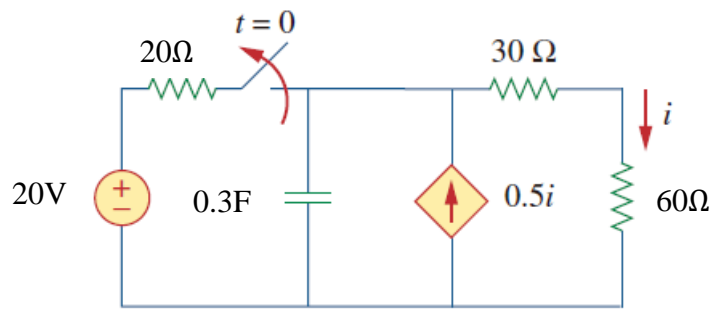


Fig. 5

6. [12%] In the circuit of Fig.6, assume the operational amplifier is ideal and works in linear region. Find v_o and i_o , given that $v_s = 5u(t)$ V and $v(0_-) = 2$ V.

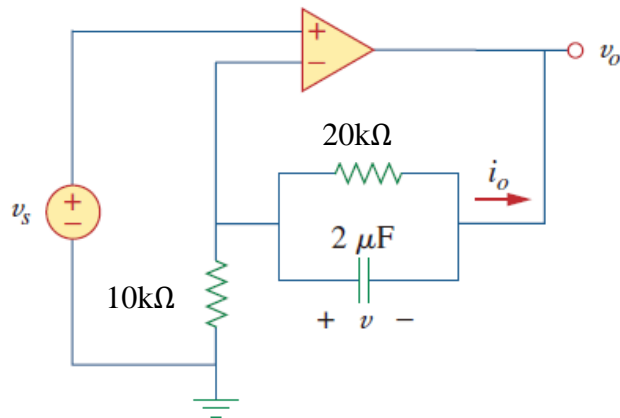


Fig. 6

7. [14%] When the input to the circuit shown in Fig.7 is the voltage source with $V_s(t) = 5 - 2u(t)$. The output is the voltage $V_o(t) = 6 + 4e^{-100t}$ V, $t \geq 0$. Determine the values of R_1, R_2 .

(Assume that the circuit reached steady state before $t = 0$ with op amp working in linear region.)

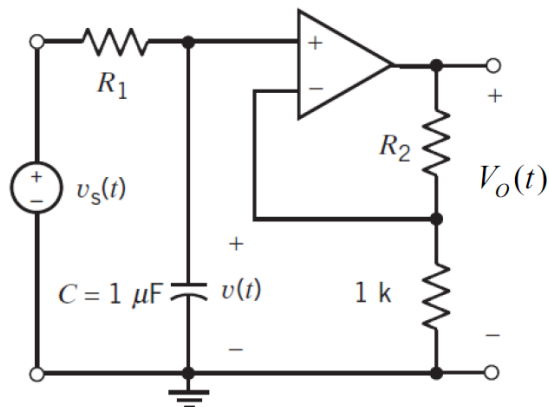


Fig. 7

8. [14%] The switch in Fig.8 has been open for a long time before $t = 0$. Find the current through the inductor $i_o(t)$ for $t \geq 0$.

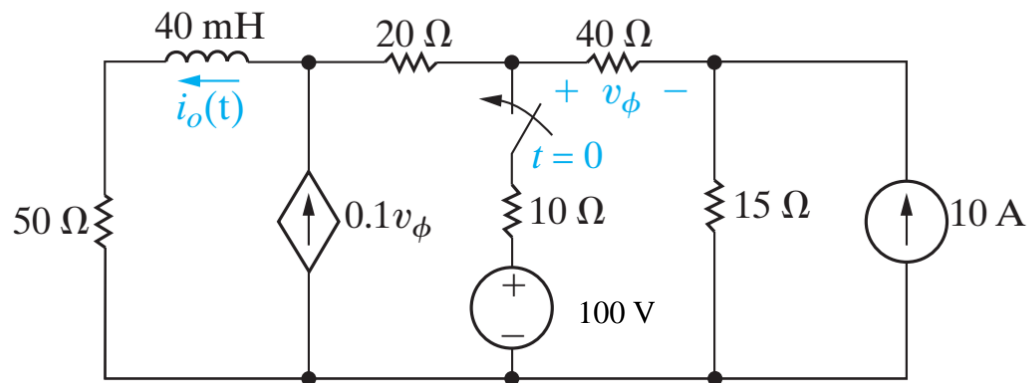


Fig. 8

9. [14%] The voltage source $V_s(t) = 6e^{-5t}\text{V}(t \geq 0)$, the capacitor voltage at $t = 0_-$ is $v_C(0_-) = 3\text{V}$. Assume the ideal op amp works in linear mode all the time. Find $v_o(t)$.

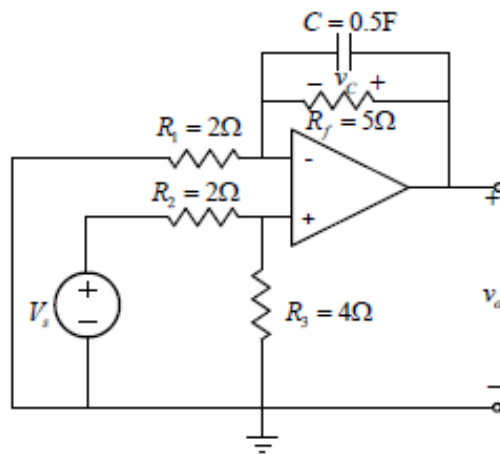


Fig. 9