EE 111 Homework 3

Due date: Apr. 3^{rd}, 2019
Turn in your homework in class

Rule:

- Work on your own. Discussion is permissible, but 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 submisson will be accepted.

1. In the circuit shown in Fig.1 below

$$v(t) = 72e^{-100t}V, t > 0$$

$$i(t) = 9e^{-100t}mA, t > 0$$

(a) Find the values of R and C.

(b) Calculate the time constant τ.

(c) Determine the time required for the voltage to decay half its initial value at $t = 0$.

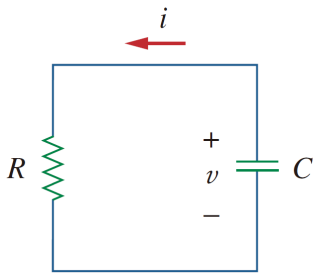

Fig. 1

2. Assuming that the switch in Fig.2 has been in position A for a long time and is moved to position B at $t = 0$, Then at $t = 1$ second, the switch moves from B to C. Find $v_C(t)$ for $t \geq 0$.

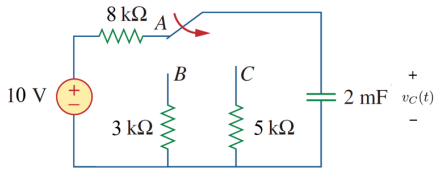

Fig. 2

3. For the circuit in Fig.3, find i_o for $t > 0$.

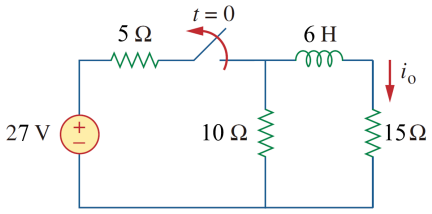

Fig. 3

4. Consider the circuit of Fig.4.

   (a) Find $v_o(t)$ in Fig.4(a) if $i(0) = 6A$ and $v(t) = 0V$.

   (b) Find $v_o(t)$ in Fig.4(b) if $i(0) = 6A$ and $v(t) = 24u(t)V$.

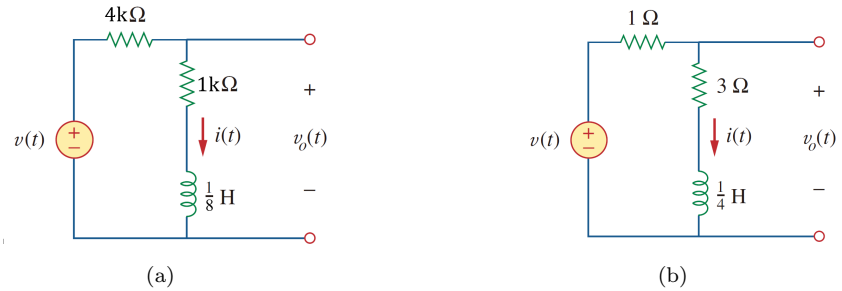

Fig. 4

5. For the circuit in Fig.5,

$$v = 40e^{-25t}V$$

and

$$i = 10e^{-25t}A, \quad t > 0$$

(a) Find L and R.

(b) Determine the time constant.

(c) Calculate the initial energy in the inductor.

(d) What fraction of the initial energy is dissipated in 20 ms?

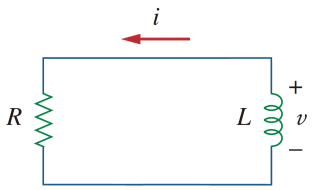

Fig. 5

6. The switch in Fig.6 has been in position a for a long time. At $t = 0$, it moves to position b. Calculate $i(t)$ for $t > 0$.

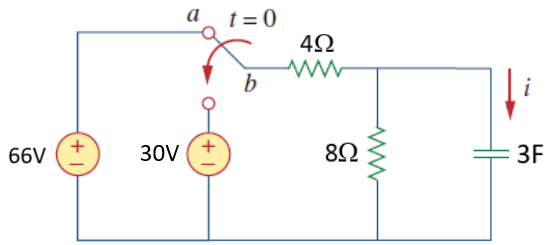

Fig. 6

7. The switch in Fig. 7 has been in position a for a long time, at $t = 0$, it moves to position b. Find $v(t)$ for $t < 0$ and $t > 0$ in the circuit.

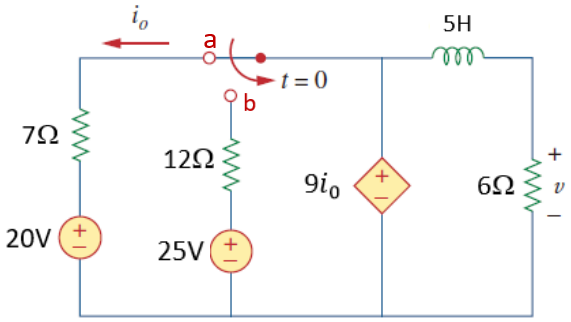

Fig. 7

8. If the input pulse in Fig.8 is applied to the circuit in Fig. 8 (b), determine the response $i(t)$ while $i(0) = 0.75A$.

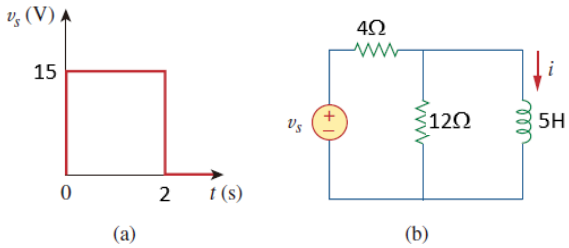

Fig. 8

9. If $v(0) = 6\ V$, find $v_0(t)$ for $t > 0$ in the op amp circuit in Fig.9. Let R = 3kΩ and $C = \frac{1}{3}$ μF.

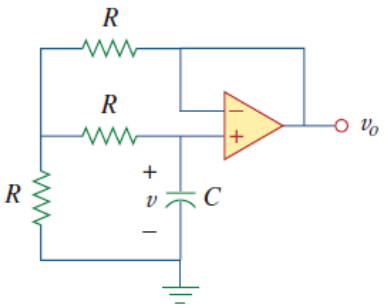

Fig. 9

10. At the time the double-pole switch in the circuit shown in Fig. 10 is closed, the initial voltages on the capacitors are 12V and 4V, as shown. Find the numerical expressions for $v_0(t)$, $v_2(t)$, and $v_f(t)$, as long as the ideal op amp operates in its linear range. (Hint: Integrating Amplifier)

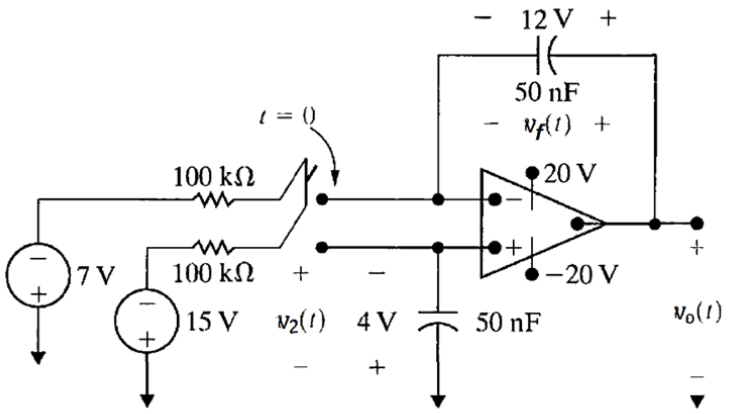

Fig. 10