

## Principles of EE2

### HW #1

Due Date : 5th of Feb., 2015

Place to submit: class-room A1. 206

1. The switch in the circuit shown in Fig. 1 has been closed for a long time before opening at  $t = 0$ .
  - a. find  $i_1(0^-)$  and  $i_2(0^-)$
  - b. find  $i_1(0^+)$  and  $i_2(0^+)$
  - c. find  $i_1(t)$  for  $t \geq 0$
  - d. find  $i_2(t)$  for  $t \geq 0^+$
  - e. explain why  $i_2(0^-) \neq i_2(0^+)$

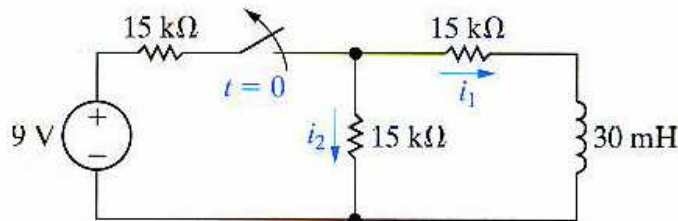


Fig. 1

2. In the circuit shown in Fig. 2, the switch has been in position a for a long time. At  $t = 0$ , it moves instantaneously from a to b.
  - a. Find  $v_o(t)$  for  $t \geq 0$
  - b. What is the total energy delivered to the 1 kΩ resistor?
  - c. How many time constants does it take to deliver 95% of the energy found in (b)?

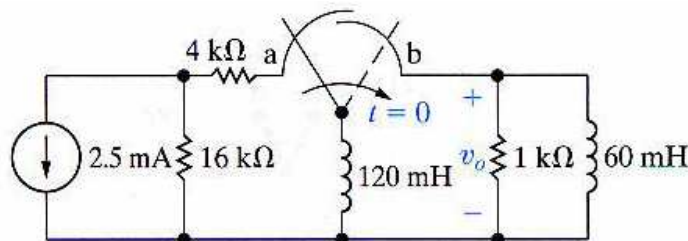


Fig. 2

3. The two switches shown in the circuit in the Fig. 3 operate simultaneously. Prior to  $t = 0$  each switch has been in its indicated position for a long time. At  $t = 0$  the two switches move instantaneously to their new positions. Find
- $v_o(t)$  for  $t \geq 0^+$
  - $i_o(t)$  for  $t \geq 0$

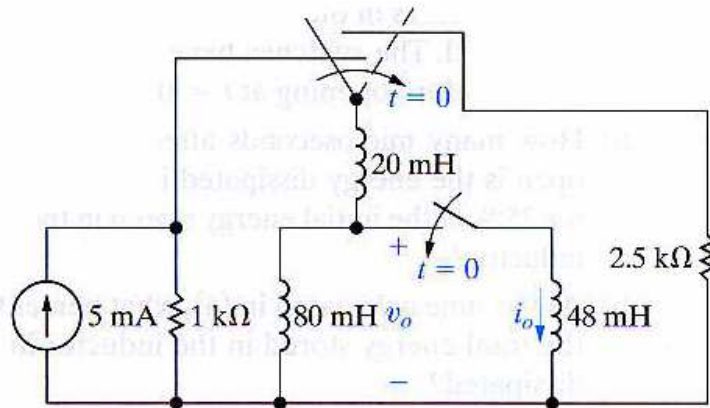


Fig. 3

4. At the time the switch is closed in the circuit shown in Fig. 4, the capacitors are charged as shown.
- Find  $v_o(t)$  for  $t \geq 0^+$
  - What percentage of the total energy initially stored in the three capacitors is dissipated in the  $25 \text{ k}\Omega$  resistor?
  - Find  $v_1(t)$  for  $t \geq 0$
  - Find  $v_2(t)$  for  $t \geq 0$
  - Find the energy (in millijoules) trapped in the ideal capacitors.

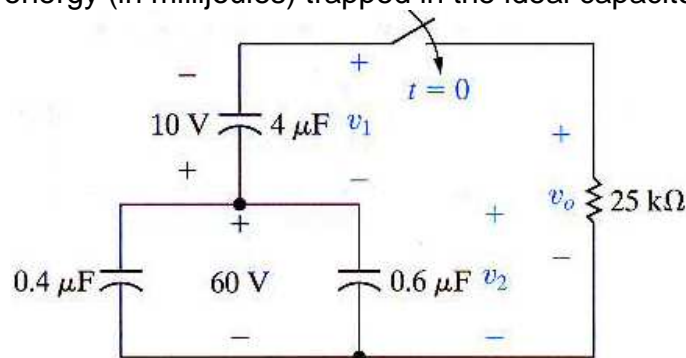


Fig. 4

5. The switch in the circuit in Fig. 5 has been in position x for a long time. The initial charge on the 15 nF capacitor is zero. At  $t = 0$ , the switch moves instantaneously to position y.
- Find  $v_o(t)$  for  $t \geq 0^+$
  - Find  $v_1(t)$  for  $t \geq 0$
  - find (in microjoules) the energy delivered to the 200 k $\Omega$  resistor; the energy trapped in the capacitor; and the initial energy stored in the capacitors.

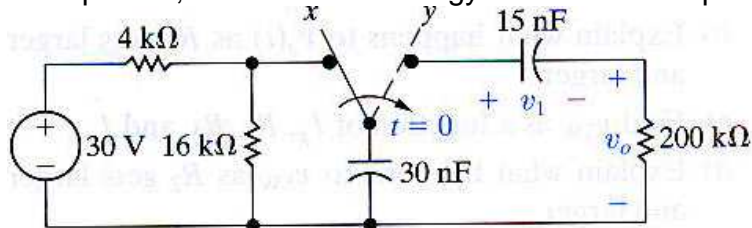


Fig. 5

6. There is no energy stored in the circuit of Fig. 6 at the time the switch is closed.
- Find  $i_o(t)$  for  $t \geq 0$
  - Find  $v_o(t)$  for  $t \geq 0^+$
  - Find  $i_1(t)$  for  $t \geq 0$
  - Find  $i_2(t)$  for  $t \geq 0$
  - Do your answers make sense in terms of known circuit behavior?

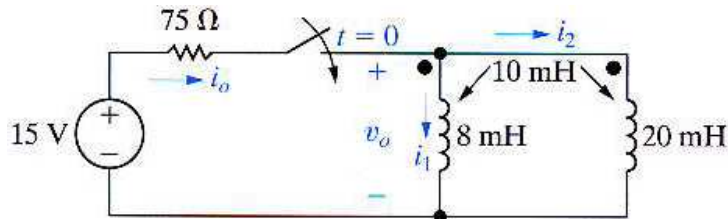


Fig. 6

**Note:** Let submit on the due date. Otherwise, a penalty of 20% per day will be applied!