

Academic year 2018/2019

Electrical Circuits (2)
2nd year elec.

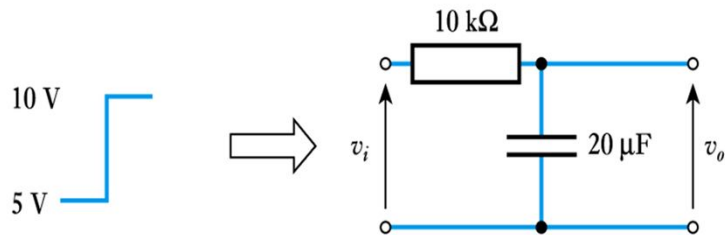
CHAPTER 2:
FIRST ORDER CIRCUITS

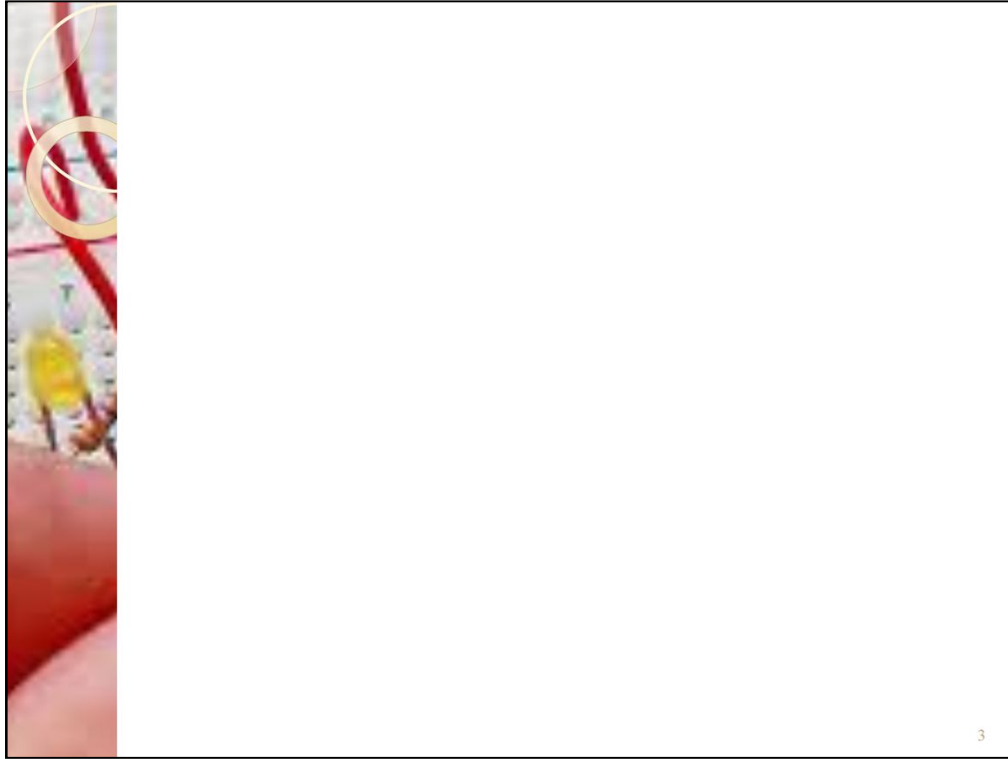
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Example 1

The input voltage to the following RC network undergoes a step change from 5V to 10V at time $t = 0$. Derive an expression for the resulting output voltage.





FIRST ORDER CIRCUITS

Example 2

- For the circuit below, find the expression of $i_o(t)$ and $V_o(t)$. The switch was closed for a long time, and at $t = 0$, the switch was opened.

The circuit diagram shows a 20A current source on the left. A switch is in series with the current source and opens at $t = 0$. A 0.1Ω resistor is connected in parallel with the current source. A $2H$ inductor is connected in parallel with the switch. A 2Ω resistor is connected in series with the inductor. A 10Ω resistor is connected in parallel with the 2Ω resistor. A 40Ω resistor is connected in parallel with the 10Ω resistor. The current through the 40Ω resistor is labeled i_o (indicated by a red arrow), and the voltage across it is labeled V_o (indicated by a red arrow and '+' and '-' signs).

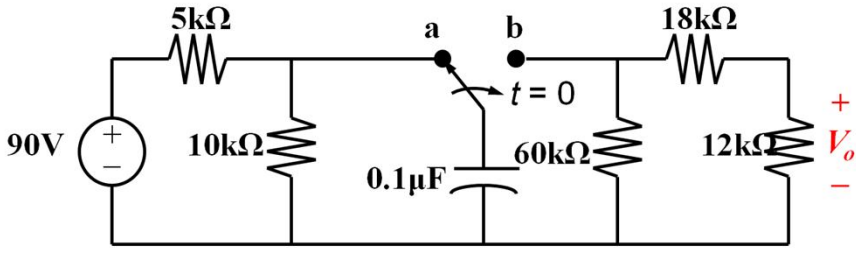
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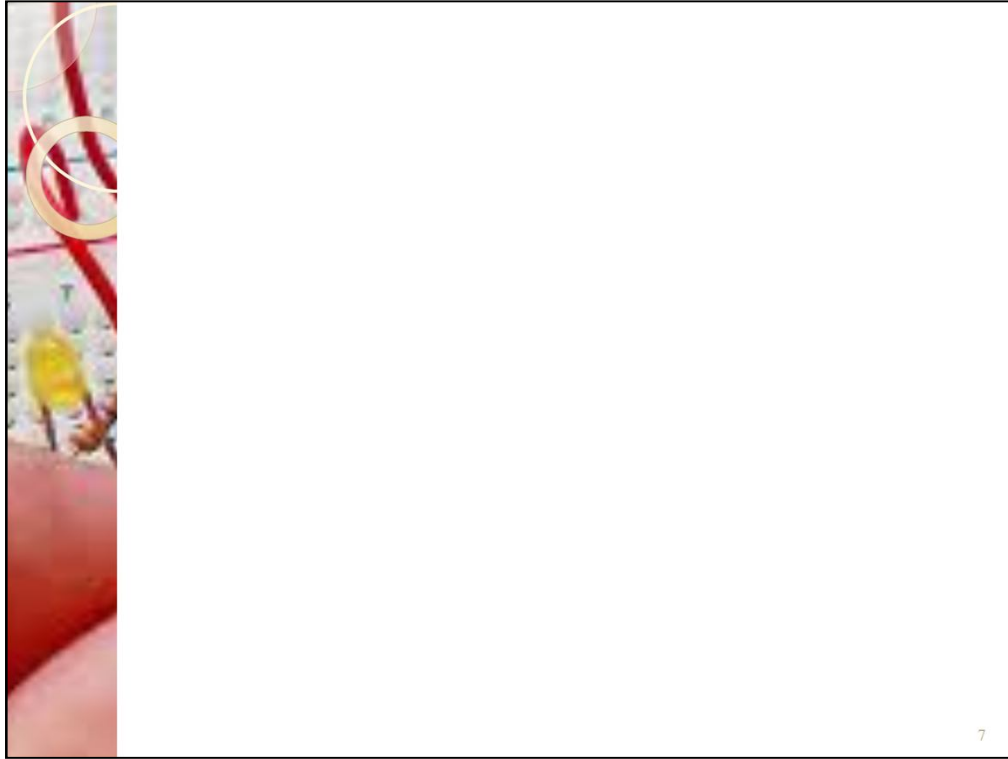
FIRST ORDER CIRCUITS

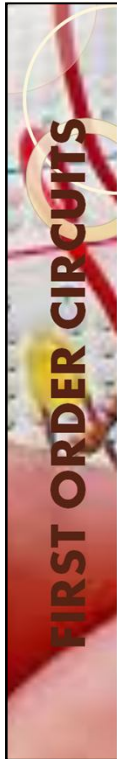
Example 3

The switch has been in position *a* for a long time. At time $t = 0$, the switch moves to *b*. Find the expressions for the $v_c(t)$, $i_c(t)$ and $v_o(t)$ and hence sketch them for $t = 0$ to $t = 5\tau$.



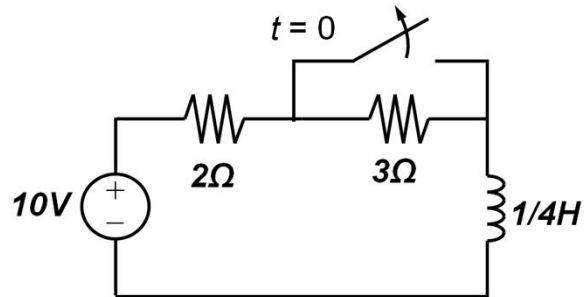
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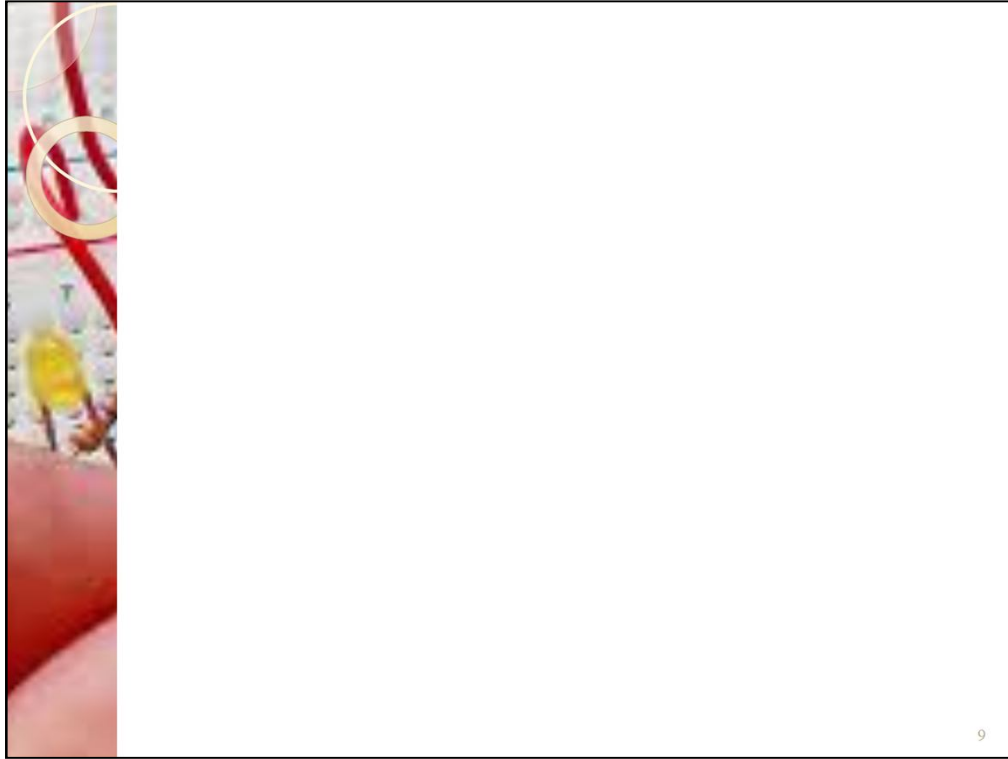




Example 4

The switch is closed for a long time at $t = 0$, the switch opens. Find the expressions for $i_L(t)$ and $v_L(t)$.



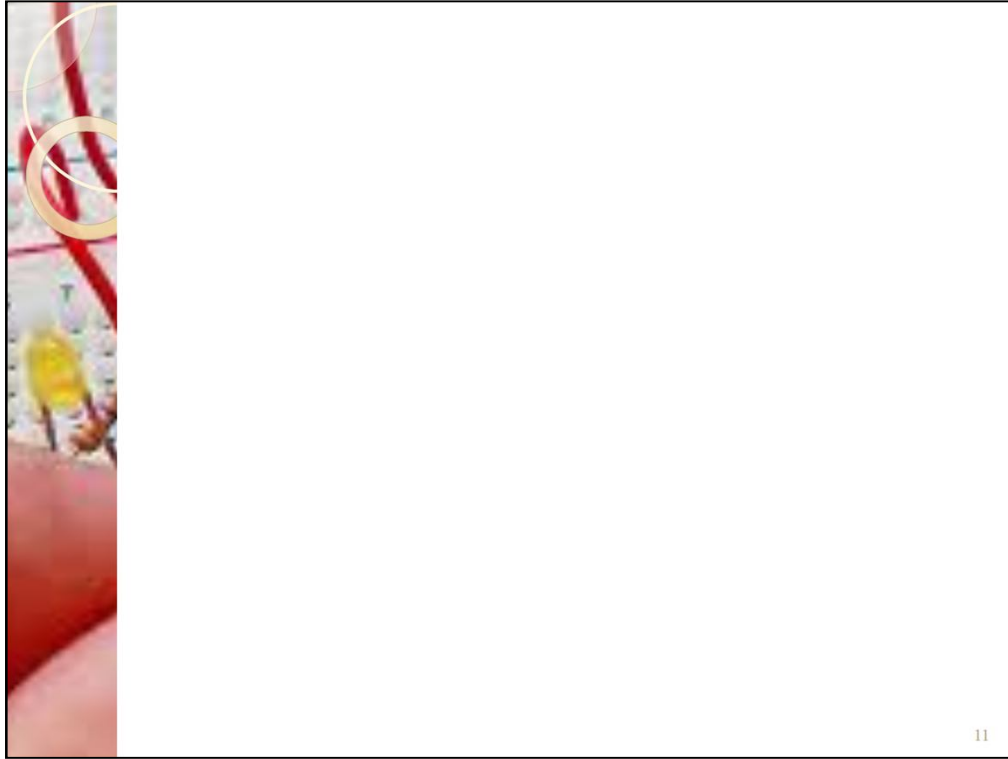


FIRST ORDER CIRCUITS

Example 5

The switch has been in position *a* for a long time. At $t = 0$, the switch moves to *b*. Find $V_c(t)$ for $t > 0$ and calculate its value at $t = 1\text{s}$ and $t = 4\text{s}$.

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Example 6

(book page 42)

At $t=0$, switch 1 is closed, and switch 2 is closed 4s later.

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

Calculate I for $t=2\text{sec}$ and $t=5\text{sec}$

