Information Technology University, Lahore, Pakistan

Electrical Network Analysis (EE-241)

Assignment # 2, Spring 2021

Submission Deadline: Wednesday April 21, 2021 Maximum Marks: 100

- Scan all the pages in the required sequence and post on the Google Classroom as a single pdf file.

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1. For the circuit shown in Figure 1, determine $i_C(0^-)$, $i_L(0^-)$, $i_R(0^-)$, $v_C(0^-)$, $i_C(0^+)$, $i_L(0^+)$, $i_R(0^+)$, $v_C(0^+)$, and $v_C(t)$. [20]

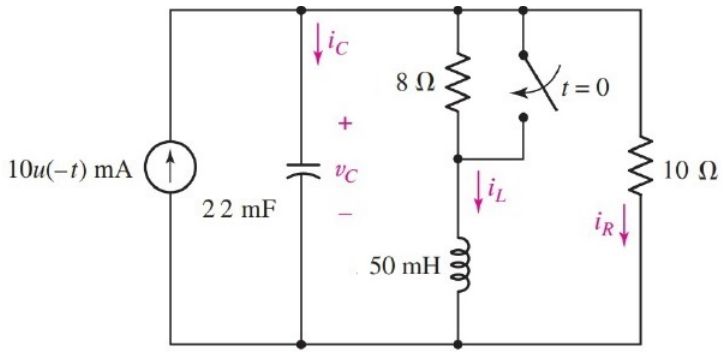

Figure 1: Circuit for problem 1

2. For the circuit of Figure 2,

   (a) Obtain an expression for v_C(t) valid for all $t > 0$. [10]

   (b) Determine $v_C(t)$ at $t = 10\,\text{ms}$ and $t = 600\,\text{ms}$. [4]

   (c) Replace the $1\,\Omega$ resistor with a $100\,\text{m}\Omega$ resistor, and the $5\,\Omega$ resistor with a $200\,\text{m}\Omega$ resistor. Assuming the passive sign convention, obtain an expression for the capacitor current which is valid for $t > 0$. [6]

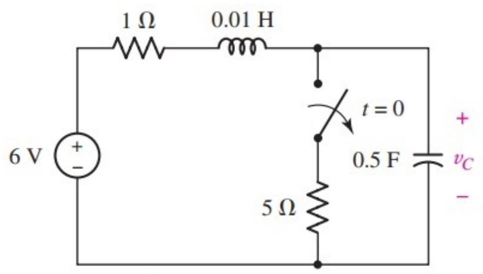

Figure 2: Circuit for problem 2

3. (a) Assuming there are no longer any transients present, determine the current labeled i_L of Figure 3. Express your answer as a single sinusoid. [10]

   (b) Calculate the power dissipated in the $2\,\Omega$ resistor of Figure 4 assuming there are no transient present. Express the answer in terms of a single sinusoidal function. [10]

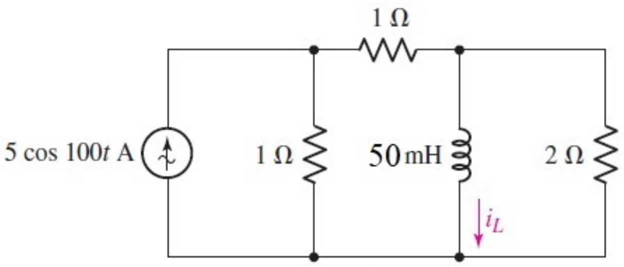

Figure 3: Circuit for problem 3

4. (a) Assume that $v_s = V_m \cos \omega t$ is applied to a series RC circuit. Derive the voltage response across the capacitor. [10]

   (b) Using the equation derived in part (a) to find the steady-state expression for $v_c(t)$ if $v_s = 20 \sin 100t$, $R = 10\,\Omega$ and $C = 100\,\mu\text{F}$. [5]

   (c) Insert an appropriate complex source into the circuit of part (b) and use it to determine the steady state expressions for $i_C(t)$ and $v_C(t)$. [5]

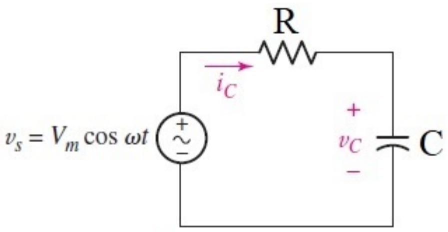

Figure 3 : Circuit for problem 4

5. (a) For the circuit shown in Figure 4, if $i_s = 2 \cos 20t$ A, use a suitable complex source replacement to obtain a steady-state expression for $i_L(t)$. [10]

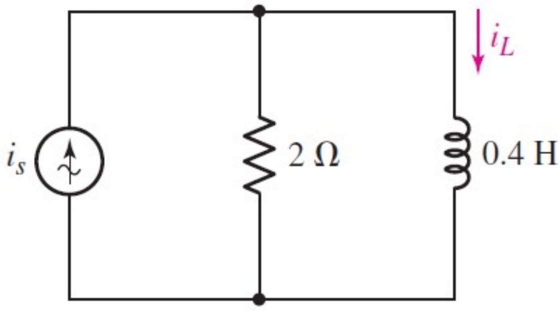

Figure 4: Circuit for problem 5

   (b) Employ a suitable complex source to determine the steady-state current i_L in the circuit of Figure 5. [10]

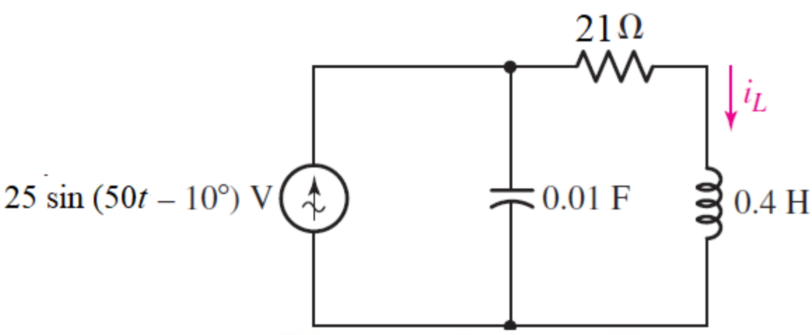

Figure 5: Circuit for problem 5b