Phys219_2017 - Ryan Kaufmann/Exp. 2 (LCR Resonance Circut)/Prelab assignment for Exp2

SIGNED by Ryan Kaufmann Oct 02, 2017 @10:42 AM PDT

Ryan Kaufmann Oct 02, 2017 @09:06 AM PDT

Experiment 2: Pre-Lab

Ryan Kaufmann Oct 02, 2017 @09:07 AM PDT

Questions 1:

Ryan Kaufmann Oct 02, 2017 @09:09 AM PDT

Consider the circuit of Fig. 1. What are γ and ω_0 with in units of inverse seconds?

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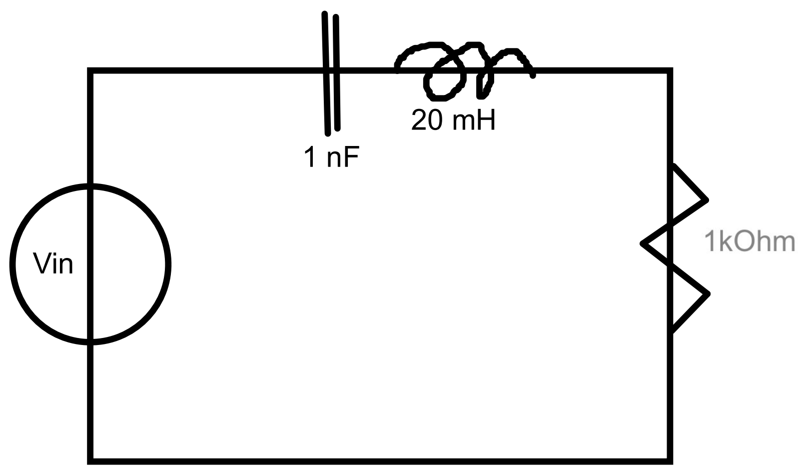

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We can use the equations given to find the γ and ω_0 of the given figure. Thus we get the following:

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\gamma = \frac{R}{L} = \frac{1000}{0.020}Hz = 50*10^3 Hz

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Question 2:

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Assume V_0 and V_{in} in equations 1 and 4 are both +1V. Use the above values of γ and ω_0 to make plots of equations 1 and 4 with units on the x and y axes. Modify the python script Plotfunction.py for this purpose.

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Plugging in our values for γ and ω_0 gives us the following equations:

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V_r(t) = \frac{\gamma}{\omega_0}e^{\frac{-t\gamma}{2}}\cos(\omega_0t+\phi_0) V_r(t) = \frac{50*10^3}{224*10^3}e^{\frac{-50*10^3t}{2}}\cos(224*10^3t+\frac{\pi}{2}) V_r(t) = 0.2232e^{-25000t}\cos(224000t + \frac{\pi}{2}) V_r^0(\omega) = \frac{1}{\sqrt{1+(\frac{1}{\gamma\omega})^2(\omega^2-\omega_0^2)^2}} V_r^0(\omega) = \frac{1}{\sqrt{1+(\frac{1}{50000\omega})^2(\omega^2-224000^2)^2}}

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And the following graphs:

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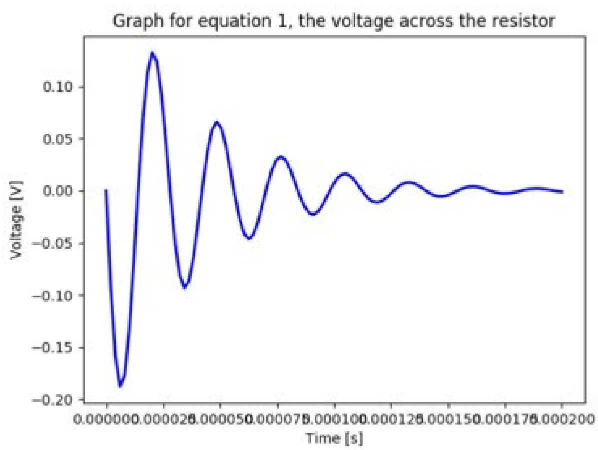

PrelabEquation1.png(31.7 KB)

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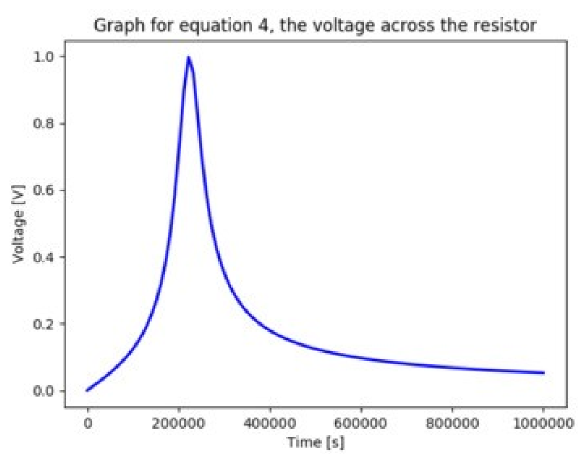

PrelabEquation4.png(25.8 KB)

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Question 3:

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In section 4.1, estimate the period of the square wave you need to observe 10 oscillations in $V_r(t)$.

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We can take our number for ω_0 and use it to calculate the period for 10 oscillations in $V_r(t)$. This calculation is a follows:

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$\omega_0 = 224000Hz = 2\pi f$ $f = \frac{224000}{2\pi}Hz = 35650.7Hz$ $T_1 = \frac{1}{f} = 0.00002805seconds$ $T_{10} = 10*T_1 = 0.0002805seconds$