KFUPM-EE DEPT.
EE205: Circuits II-082
HW # 2: Due:

Problem 1:

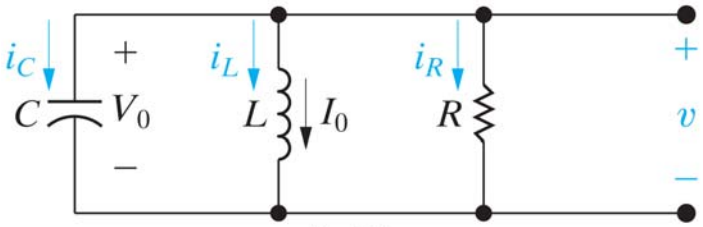

Figure: 08-01

The resistance, inductance, and capacitance in a parallel RLC circuit are 5000 Ω, 1.25 H, and 8 nF, respectively.

a) Calculate the roots of the characteristic equation that describe the voltage response of the circuit.
b) Will the response be over-, under-, or critically damped?
c) What value of R will yield a damped frequency of 6 krad/s?
d) What are the roots of the characteristic equation for the value of R found in (c) ?
e) What value of R will result in a critically damped response?

Problem 2:

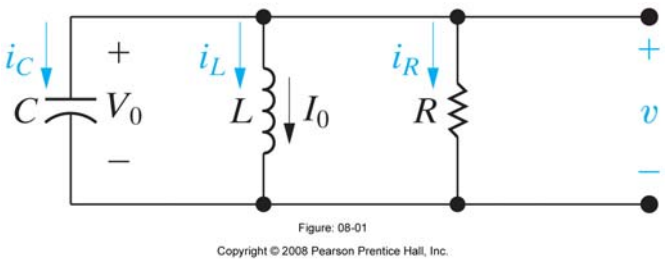

Figure: 08-01

The initial value of the voltage v in the above circuit is zero, and the initial value of the capacitor current, $i_c(0^+)$ is 15 mA. The expression for the capacitor current is known to be:

$$i_c(t) = A_1 e^{-160t} + A_2 e^{-40t}, \qquad t \geq 0^+$$

Where R is 200 Ω.

a) Find the value of α, ω_0, L, C, A_1, *and* A_2

$$\left(H \text{ int}: \frac{di_C(0)}{dt} = -\frac{di_L(0)}{dt} - \frac{di_R(0)}{dt} = \frac{v(0)}{L} - \frac{1}{R}\frac{i_C(0^+)}{C} \right)$$

b) Find the expression for $v(t)$, $t \geq 0$

c) Find the expression for $i_R(t)$, $t \geq 0$

d) Find the expression for $i_L(t)$, $t \geq 0$

Problem 3:

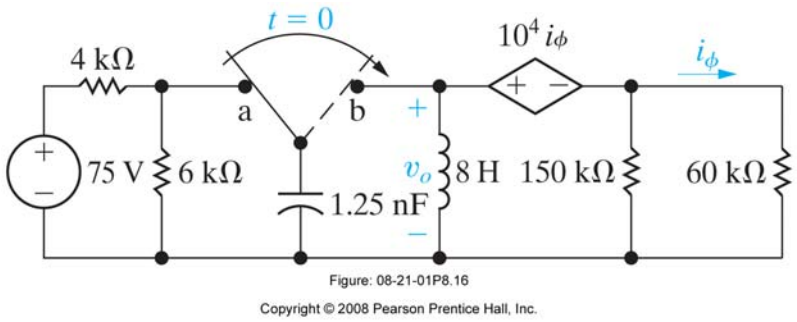

Figure: 08-21-01P8.16

The switch in the above circuit has been in position for a long time. At t = 0, the switch moves instantaneously to position b. Find $v_0(t)$ for $t \geq 0$.

Problem 4:

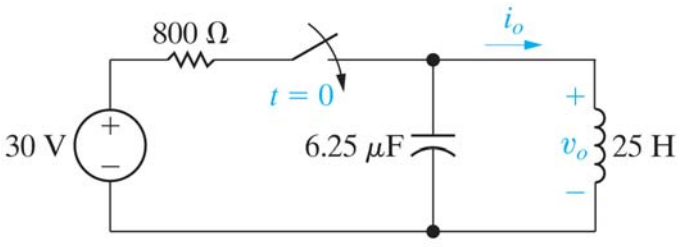

Figure: 08-21-05P8.30

There is no energy stored in the circuit in the above Figure when the switch is closed at t=0. Find $v_0(t)$ for $t \geq 0$.

Problem 5:

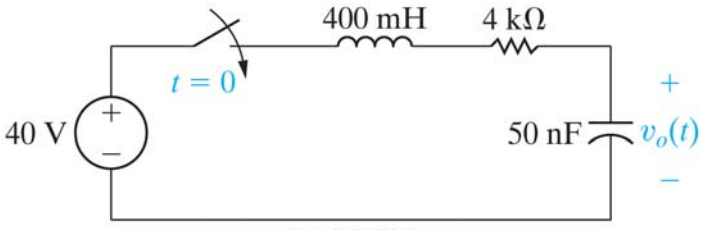

Figure: 08-21-16P8.45

The initial energy stored in the circuit in the above Figure is zero, Find $v_0(t)$ for $t \geq 0$.