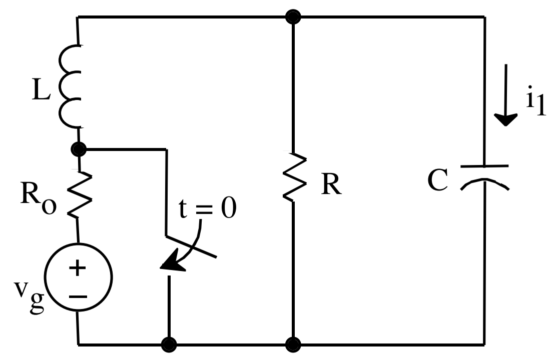
UNIT 1
PRACTICE EXAM

1. (25 points)

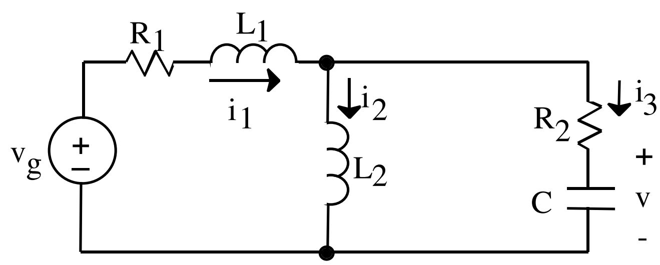


v_g is a dc voltage source
After having been open for a long time, the switch is closed at t = 0.

a. Give expressions for $i_1(0+)$ and $i_1'(0+)$, (i.e., di_1/dt at $t = 0^+$), in terms of no more than v_g, R_o, R, L, and C.

b. For L = 10 μH, choose R and C so that the system is underdamped and $\alpha = 3\cdot10^6$ rad/s, $\omega_d = 4\cdot10^6$ rad/s.

2. (25 points)



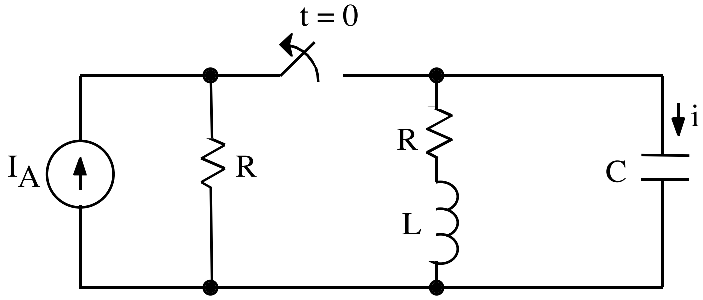
At t = 0, $v_g(t)$ switches instantaneously from $-v_o$ to $+v_o$.

a. Write the state-variable equations in terms of the state vector

$$x = \begin{bmatrix} i_1 \\ i_2 \\ v \end{bmatrix}$$

b. Evaluate the state vector x at t = 0+.

3. (50 points)



$I_A = 1$ A

$R = 2400\ \Omega$

$L = 200\ \mu H$

$C = 50$ pF

a. After being closed for a long time, the switch is opened at t = 0. Write a numerical time-domain expression for i(t), the current through the capacitance. This expression must not contain any complex numbers.

b. State whether i(t) is underdamped, overdamped, or critically damped.