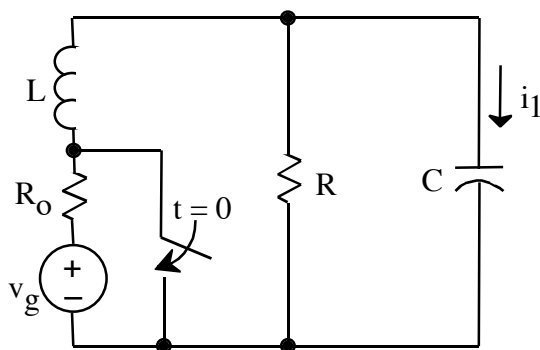


1. (25 points)

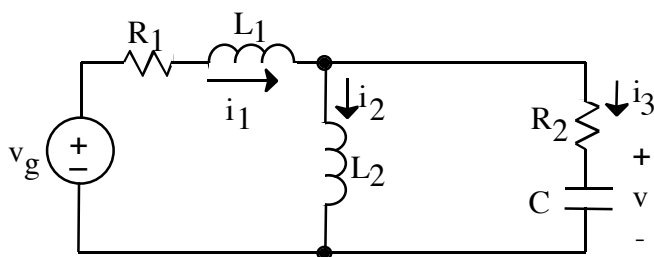


$v_g$  is a dc voltage source

After having been open for a long time, the switch is closed at  $t = 0$ .

- 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  $C$ .
- For  $L = 10 \mu\text{H}$ , choose  $R$  and  $C$  so that the system is underdamped and  $\alpha = 3 \cdot 10^6 \text{ rad/s}$ ,  $\omega_d = 4 \cdot 10^6 \text{ rad/s}$ .

2. (25 points)



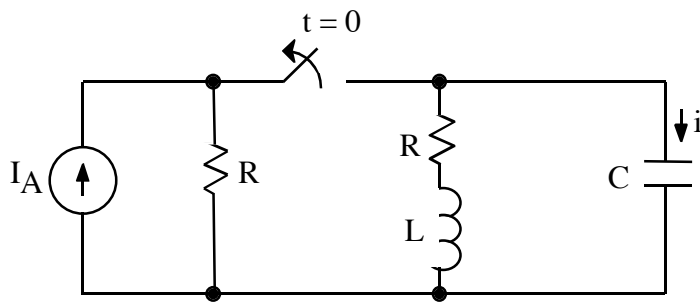
At  $t = 0$ ,  $v_g(t)$  switches instantaneously from  $-v_o$  to  $+v_o$ .

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

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

- Evaluate the state vector  $x$  at  $t = 0+$ .

3. (50 points)



$$\begin{aligned} I_A &= 1 \text{ A} \\ R &= 2400 \, \Omega \\ L &= 200 \, \mu\text{H} \\ C &= 50 \text{ pF} \end{aligned}$$

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