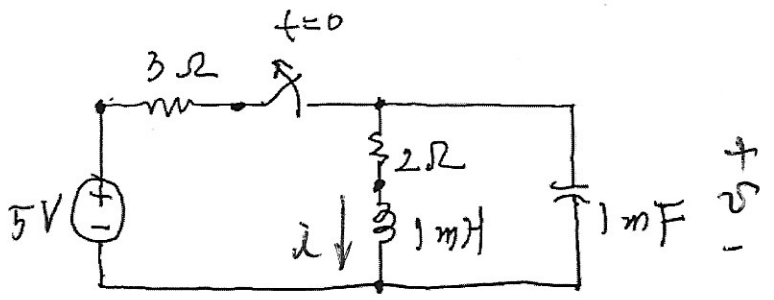
Solution

EE101 Quiz 9Encore, March 16, 2018

Name_____ Student ID_____

For a second-order circuit shown below,



(a) (4 points) Determine the voltage across 1 mF capacitor and the current through 1 mH inductor just before the switch is opened (t = 0-).

V (0-) = 2 [V]

I (0-) = 1 [A]

(b) (2 points) For t > 0, the second-order circuits is (checked the right case)

Overdamped _____

Critically damped ✓

Underdamped _____

$\alpha = \frac{R}{2L} = \frac{2}{2\times 10^{-3}} = 10^3$

$\omega_0 = \frac{1}{\sqrt{10^{-3}\cdot 10^{-3}}} = 10^3$

$\alpha = \omega_0$

(c) (4 points) Find the expression for V (t) for t > 0. You need to identify the coefficients in the expression by using initial condition.

$v(t) = A_1 e^{-\alpha t} + A_2 t e^{-\alpha t}$

$v(0) = A_1 = 2$

$v'(0+) = -\alpha A_1 + A_2 = -2000 + A_2 = -1000 \Rightarrow A_2 = 1000$

$C\frac{dv(0+)}{dt} = -i(0+)$ $\quad \frac{dv(0+)}{dt} = -\frac{1}{10^{-3}} = -10^3$

$v(t) = (2 + 1000t)e^{-1000t}$

$v(0) = 2$ ✓

$v'(0) = -2000 + 1000 = -1000$ ✓