



Princess Sumaya University for Technology

Computer Engineering Dept.

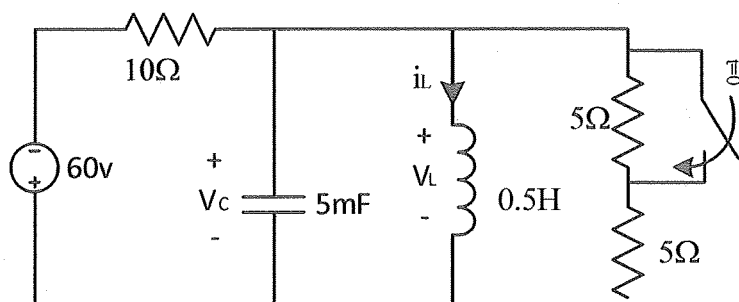
24221 Circuit Analysis I - Spring 2013

Quiz 5 - Form A

Name: Solution Duration: 15 minutes

Please make sure final answer is written in provided place.

**Question 1: In the circuit below, find the following:**



- a)  $V_c(0^+)$  (1 point)
- b)  $i_L(0^+)$  (1 point)
- c)  $\alpha$  and  $\omega_0$  (2 points)
- d) The operation mode of the circuit (Over damped, under damped or critical damping) (1 point)
- e) The complete response of  $V_L(t)$  (5 points)

(a)  $V_c(0^+) = V_c(0^-) = 0$

(b)  $i_L(0^+) = i_L(0^-) = -\frac{60}{10} = -6 \text{ A}$

(c)  $\alpha = \frac{1}{2R_{eq}C}$ ,  $R_{eq} = 5 \parallel 10 = \frac{10}{3}$

$\alpha = 30$

$\omega_0 = \frac{1}{\sqrt{LC}} = 20$

(d)  $\alpha > \omega_0 \Rightarrow \text{over damped.}$





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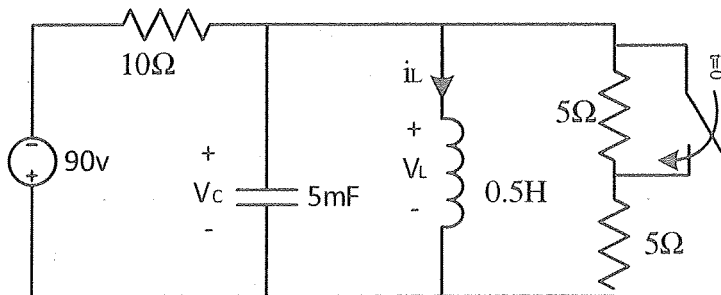
24221 Circuit Analysis I - Spring 2013

Quiz 2 - Form B

Name: Solution Duration: 15 minutes

Please make sure final answer is written in provided place.

Question 1: In the circuit below, find the following:



- $V_c(0^+)$  (1 point)
- $i_L(0^+)$  (1 point)
- $\alpha$  and  $\omega_0$  (2 points)
- The operation mode of the circuit (Over damped, under damped or critical damping) (1 point)
- The complete response of  $V_L(t)$  (5 points)

(a)  $V_c(0^+) = V_c(0^-) = 0V$

(b)  $i_L(0^+) = i_L(0^-) = \frac{-90}{10} = -9A$

(c)  $\alpha = \frac{1}{2Rc} = \frac{1}{2R_{eq} * 5 \times 10^{-3}} = \frac{1}{2 * 3.3 * 5 \times 10^{-3}} = 30$

$R_{eq} = 5 || 10 = \frac{10}{3}$

$\omega_0 = \frac{1}{\sqrt{LC}} = 20$

(d)  $\alpha > \omega_0 \Rightarrow$  over damped.

(e)  $V_L = V_{Lp} + V_{Ln}$

$V_{Lp} = 0 ; V_{Ln} = A_1 e^{s_1 t} + A_2 e^{s_2 t}$

$s_{1,2} = -30 \pm \sqrt{30^2 - 20^2} = -30 \pm 20$

$s_1 = -7.6$

$s_2 = -52.3$

$$V_{(0+)} = V_{(0-)} = A_1 e^0 + A_2 e^0 = 0$$

$$\boxed{A_1 + A_2 = 0} \quad \text{--- (1)}$$

$$i_c = C \frac{dv_c}{dt} = 0$$

$$A_1 s_1 + A_2 s_2 = 0 \quad \text{--- (2)}$$

