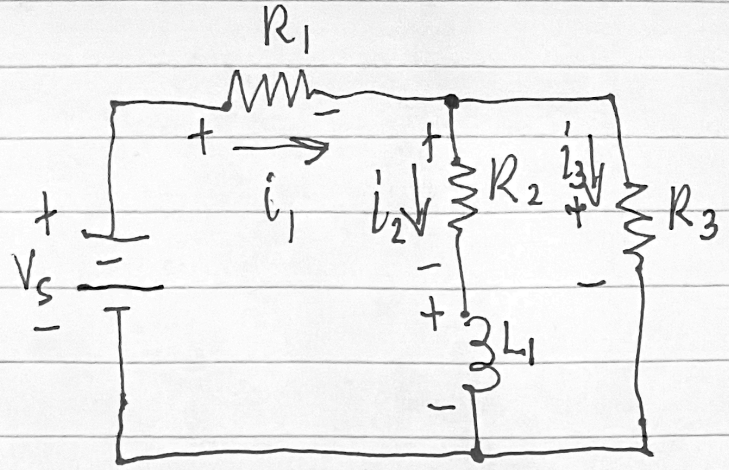


$$V_S = R_1 i_1 + R_2 i_2 + L_1 \frac{di_2}{dt}$$

$$i_1 = i_2 + i_3$$

$$R_2 i_2 + L_1 \frac{di_2}{dt} = R_3 i_3$$

$$i_3 = \frac{R_2}{R_3} i_2 + \frac{L_1}{R_3} \frac{di_2}{dt}$$

$$V_S = R_1 (i_2 + i_3) + R_2 i_2 + L_1 \frac{di_2}{dt}$$

$$V_S = R_1 i_3 + (R_1 + R_2) i_2 + L_1 \frac{di_2}{dt}$$

$$V_S = \frac{R_1 R_2}{R_3} i_2 + \frac{R_1 L_1}{R_3} \frac{di_2}{dt} + (R_1 + R_2) i_2 + L_1 \frac{di_2}{dt}$$

$$V_S = \underbrace{\left(R_1 + R_2 + \frac{R_1 R_2}{R_3}\right)}_{a} i_2 + \underbrace{\left(\frac{R_1}{R_3} + 1\right) L_1}_{b} \frac{di_2}{dt}$$

$$V_S = a i_2 + b \frac{di_2}{dt} \qquad i_2 = i_{2p} + i_{2h}$$

$$i_{2p} = k \qquad V_S = ak + 0 \qquad \underline{i_{2p} = \frac{V_S}{a}}$$

i_{2h}: $0 = a i_2 + b\frac{di_2}{dt}$

$$-a i_2 = b\frac{di_2}{dt}$$

$$-\frac{a}{b}\int_0^t dt = \int_{i_0}^{i_2}\frac{di_2}{i_2}$$

$$-\frac{a}{b}t = \ln\frac{i_2}{i_0}$$

$$e^{-\frac{a}{b}t} = \frac{i_2}{i_0}$$

$$\underline{i_{2h} = i_0 e^{-\frac{a}{b}t}}$$

$$i_2 = \frac{V_s}{a} + i_0 e^{-\frac{a}{b}t}$$

$i_2(t=0) = 0 = \frac{V_s}{a} + i_0(1)$ $i_0 = -\frac{V_s}{a}$

$$i_2(t) = \frac{V_s}{a}\left(1 - e^{-\frac{a}{b}t}\right), \quad t \geq 0$$

$i_2(\infty) = 1.23\,mA \stackrel{?}{=} \frac{V_s}{a} = \frac{12}{9.75k} = 1.23\,mA$ $e^{-t/\tau}$

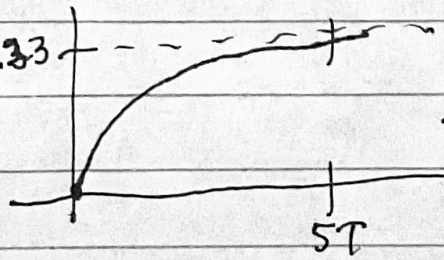
$a = R_1 + R_2 + \frac{R_1 R_2}{R_3} =$

$1.5k + 3.3k + \frac{(1.5k)(3.3k)}{(1k)} = \cancel{4.8k}$

$= 9.75k$

$b = \left(\left(\frac{1.5k}{1.0k}\right) + 1\right) 1m$

$b = 2.5m$



$$\tau = \frac{b}{a} = \frac{2.5m}{9.75k} = 0.256\,\mu s$$