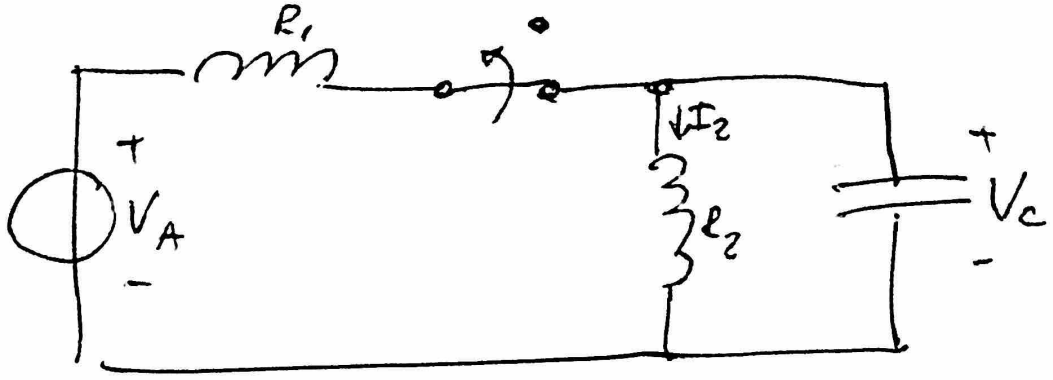
PROBLEM 5



$V_A = 5\,V$

$R_1 = 1000\,\Omega$

$R_2 = 4000\,\Omega$

$C = 2{,}5\,nF$

(A) $V_C(0) = V_A \cdot \frac{R_1}{R_1 + R_2} \Rightarrow 5 \cdot \frac{1000}{5000} = 1\,V$

$V_c(\infty) = 0$

$I_2(t=\infty) = \frac{V_C}{R_2} \Rightarrow \frac{1}{4000} = 0{,}00025 = 0{,}25\,mA$

$P_C(0) = I_2 \cdot V_C \Rightarrow 0{,}00025 \cdot 1 = 0{,}00025 = 0{,}25\,mW$

(B) $R_{TH} = \frac{R_1 \cdot R_2}{R_1 + R_2} \Rightarrow \frac{1000 \cdot 4000}{1000 + 4000} = 800\,\Omega$

$\tau = R_{TH} \cdot C \Rightarrow 800 \cdot 0{,}0000000025 = 0{,}000002 = 2\,\mu s$

$V_c(t) = V_c(\infty) + (V_c(0) - V_c(\infty)) \cdot e^{-\frac{t}{\tau}}$

$V_c(t = 10\,\mu s) = 0 + (1 - 0) \cdot e^{-\frac{0{,}00001}{0{,}000002}} = 0{,}0067 = 6{,}7\,mV$

$I_2(t = 10\,\mu s) = \frac{0{,}0067}{4000} = 0{,}00000168 = 1{,}68\,\mu A$

$P_C(10\,\mu) = I_2 \cdot V_C \Rightarrow 1{,}68\,\mu A \cdot 6{,}7\,mV = 0{,}11\,nW$