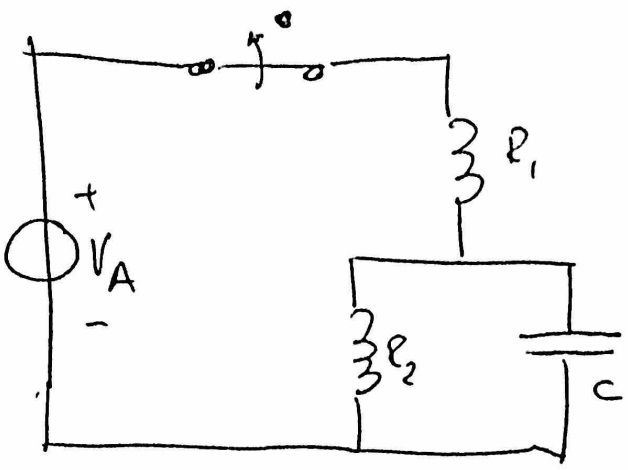
Problem 2



$V_A = 8\,V$

$R_1 = 10\,000\ \Omega$

$R_2 = 10\,000\ \Omega$

$C = 1\,nF$

$$V_c(0) = V_A \cdot \frac{R_2}{R_1 + R_2} \Rightarrow 8 \cdot \frac{10000}{10000+10000} = 4$$

$V_c(0) = 4\,V$

$V_c(\infty) = 0$

(A) $$E = \frac{C \cdot V^2}{2} \Rightarrow \frac{1nF \cdot 4^2}{2} = 8\,nJ$$

$P_c(0) = 8\,nJ$

(B) $R_{TH} = R_1 + R_2 = 20\,000\ \Omega$

$\tau = R_{TH} \cdot C \Rightarrow 20000 \cdot 1nF = 20\,us$

$$E = \frac{C \cdot V^2}{2} \Rightarrow V = \sqrt{\frac{2E}{C}}$$

$$\sqrt{\frac{2E}{C}} = V_c(\infty) + (V_c(0) - V_c(\infty)) \cdot e^{\frac{-t}{\tau}}$$

$$\sqrt{\frac{2 \cdot 1 \cdot 10^{-9}}{1 \cdot 10^{-9}}} = 0 + (4 - 0) \cdot e^{\frac{-t}{20 \cdot 10^{-6}}}$$

$t = 20\,us$

$P_c(t = 0{,}00002) = 1\,nJ$