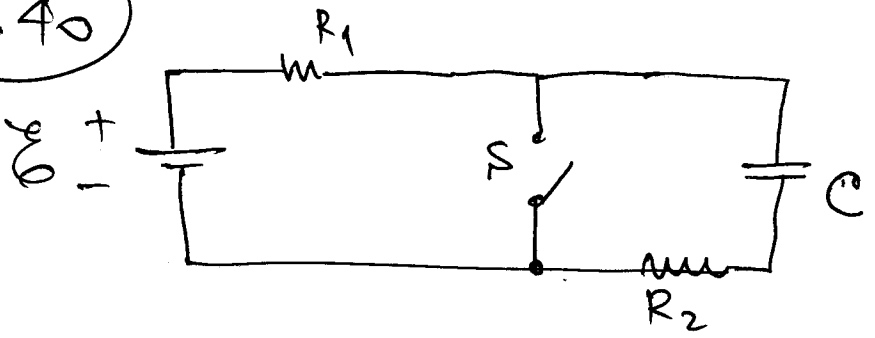
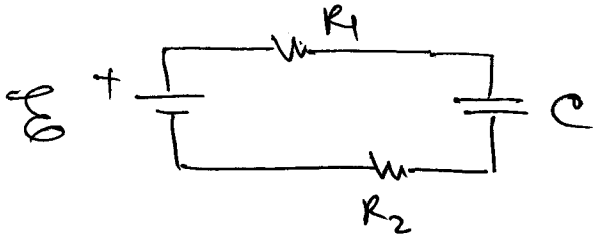
21.40



$C = 10\,\mu F$
$\mathcal{E} = 10\,V$
$R_1 = 50\,k\Omega$
$R_2 = 100\,k\Omega$

(a) before "S" is closed the circuit looks like

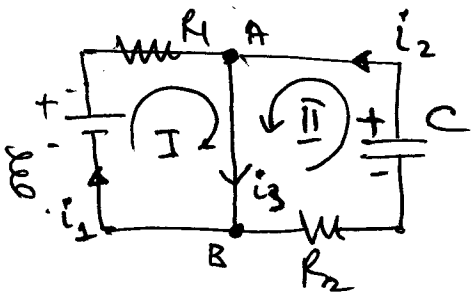


where R_1, R_2 are in series from the point of view of C and $\mathcal{E}$

$$\Rightarrow R_{total} = R_1 + R_2 = 150\,k\Omega$$

$$\tau_a = RC = 150\cdot10^3\,\Omega \cdot 10\cdot10^{-6}\,F = 1.5\,sec$$

(b) after "S" is closed we get:



A and B have the same potential and therefore loop I does not feel II and vice-versa

The time constant for "C" branch is

$$\tau_b = R_2 C = 1\,sec$$

(c)
$$\begin{cases} i_3 = i_1 + i_2 & (A) \\ \mathcal{E} = R_1 i_1 & (I) \\ u_c = R_2 i_2 & (II) \end{cases} \rightarrow i_3 = \frac{\mathcal{E}}{R_1} + \frac{\mathcal{E} e^{-t/R_2 C}}{R_2}$$

But $u_c = u_0 e^{-t/\tau_b}$

$\perp = \mathcal{E}$ (since charging was up to $\mathcal{E}$)