Phys Final #1

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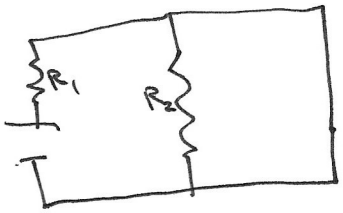
a) $C_{eq}^{-1} = \frac{1}{C_1} + \frac{1}{C_2} \therefore C_{eq} = \left(\frac{1}{400} + \frac{1}{400}\right)^{-1} = \left(\frac{2}{400}\right)^{-1} = 200\ \mu F$

b)



@ $t = 0^+$ C_{eq} acts as a wire $\therefore$ $R_{R_2} = 0$

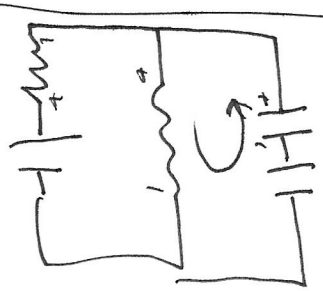
$I_{R_1} = \frac{V}{R_1} = \frac{100}{300} = \frac{1}{3} A$

c)

@ $t = \infty$ ~~Set~~ No I goes through C_{eq} $\therefore I = \frac{V}{R_{eq}} = \frac{V}{R_1 + R_2} = \frac{100}{500} = \frac{1}{5} A$

$I_{R_1} = I_{R_2}$

D)



C in series have same charge

$Q = CV$

$-R_2 I + \frac{Q_{tot}}{C_{eq}} = 0 \rightarrow Q_{eq} = C_{eq} R_2 I = 200\ \mu F \cdot 200\ \Omega \cdot \frac{1}{5} A$

$= 8.0 \times 10^{-3}\ C$

E)

$I(t) = I_0 e^{-t/RC}$ $\tau = RC = 200 \cdot 200\ \mu F = 0.04$ ~~sec~~ s

$\therefore I(t) = \frac{1}{5} A\, e^{-t/0.04}$