

An R-C circuit consists of a $5\mu\text{F}$ capacitor, an $8 \times 10^5 \Omega$ resistor, and a 12 V power supply. Find the time constant for the circuit, the maximum voltage across the capacitor, the maximum current in the circuit.

$$t = RC = 4s$$

$$V_{\max} = V_{\text{app}} = 12v$$

$$I_{\max} = \frac{V_{\text{app}}}{R} = \frac{12v}{800k\Omega} = 0.000015\text{amps}$$

For the circuit in the previous problem, after how many time constants will the current through the circuit decrease to 1/4 of its initial value?

$$I(t) = I_0 e^{-t/RC} \rightarrow \frac{I}{I_0} = \frac{1}{4} = e^{-t/RC} \rightarrow \frac{1}{4} = e^{-t/4}$$

$$\ln \frac{1}{4} = \ln e^{-t/4}$$

$$-1.39 = -\frac{t}{4} \therefore t = 5.5s$$