Answer on Question #74366 Physics / Other

A $C = 2\mu$F capacitor charged originally to a potential difference of $V_0 = 60$ V is discharged across a $R = 22$mΩ resistor as shown in the figure. Calculate the time constant of the circuit and the potential difference across the capacitor after this time constant time?

Solution:

The time constant

$$\tau = RC = 22 \times 10^{-3} \times 2 \times 10^{-6} = 44 \times 10^{-9} \text{ s}$$

The potential difference across the capacitor as a function of time

$$V(t) = V_0 e^{-\frac{t}{\tau}}$$

So

$$V(\tau) = V_0 e^{-1} = 60 \times e^{-1} = 22 \text{ V}$$

Answers: 44×10^{-9} s, 22 V