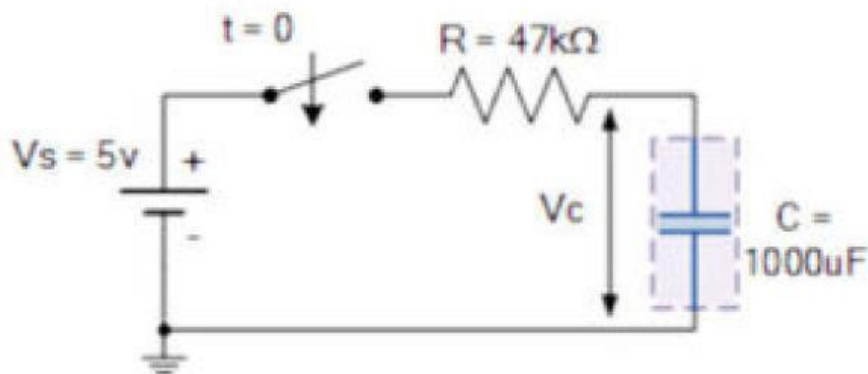


Based on circuit below, find:

1. time constant
2. Voltage capacitor after switch closed at 150s
3. Current in circuit after switch closed at 150s
4. time taken to capacitor charged to 3V



SOLUTION:

1. Time Constant (τ)

The time constant for an RC circuit is:

$$\tau = \square \times \square$$

Given:

- $R = 47\text{ k}\Omega = 47000\ \Omega$
- $C = 1000\ \mu\text{F} = 1000 \times 10^{\square}\text{ F} = 0.001\text{ F}$

$$\tau = 47000 \times 0.001 = \square\text{ seconds}$$

2. Voltage Across Capacitor at $t = 150 \text{ s}$

The voltage across a charging capacitor is:

$$V_C(t) = V_s \left(1 - e^{-\frac{t}{\tau}}\right)$$

Given:

- $V_s = \boxed{} \text{ V}$
- $t = \boxed{} \text{ s}$
- $\tau = \boxed{} \text{ s}$

$$V_C(150) = \boxed{} \left(1 - e^{-\boxed{}}\right) \approx 5 \left(1 - e^{-\boxed{}}\right)$$

$$e^{-3.19} \approx \boxed{}$$

$$V_C(150) \approx \boxed{} \times (1 - \boxed{}) = \boxed{} \times \boxed{} = \boxed{} \text{ V}$$

3. Current in Circuit at $t = 150 \text{ s}$

The current in an RC charging circuit is:

$$I(t) = \frac{V_s}{R} \cdot e^{-\frac{t}{\tau}}$$

$$I(150) = \frac{\boxed{}}{\boxed{}} \cdot e^{-\boxed{}} \approx 0. \boxed{} \text{ A} \cdot \boxed{} \approx \boxed{} \mu\text{A}$$

4. Time Taken for Capacitor to Charge to 3V

We solve for t in:

$$V_C(t) = V_s \left(1 - e^{-\frac{t}{\tau}}\right)$$

$$\square = \square \left(1 - e^{\square}\right)$$

$$\frac{3}{\square} = 1 - e^{-\frac{t}{47}}$$

$$\Rightarrow e^{-\frac{t}{47}} = \square$$

Take natural log:

$$-\frac{t}{47} = \square(0.4)$$

$$\Rightarrow t = -47 \cdot \ln(0.4) \approx 47 \times \square = \square \text{ s}$$

✓ Summary:

Quantity	Value
Time Constant (τ)	s
Voltage at 150 s	$\approx$ V
Current at 150 s	$\approx$ μ A
Time to reach 3 V	$\approx$ s