TEAM NAME (printed): * SOLUTIONS *

Team members **PRESENT** (printed names): _____

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Show your work for potential partial credit

1. What is the capacitance value of a capacitor if 300 µC of charge are present when 150 V are applied across its plates?

$$C = \frac{Q}{V} = \frac{300\mu C}{150V} = \boxed{2\mu F}$$

2. How long will it take for a 3.3 µF capacitor to effectively discharge when connected in series with a 820 ohm resistor?

$$5\tau = 5(R)(C) = 5(3.3\mu F)(820\Omega) = \boxed{13.53\ mS}$$

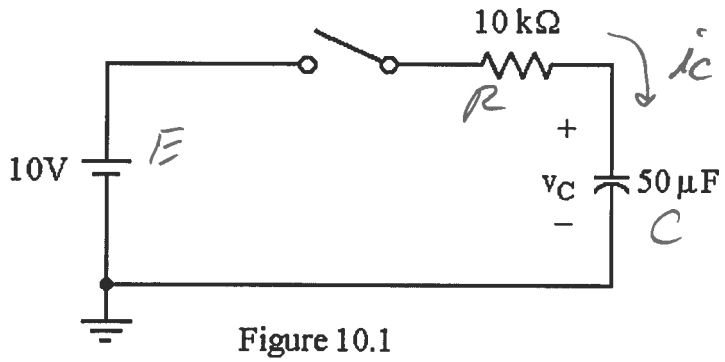

Figure 10.1

3. See Figure 10.1. What is the time constant τ for this circuit?

$$\tau = RC = (10k\Omega)(50\mu F) = \boxed{0.5\ SECONDS}$$

Questions 4 and 5 on the back →

4. See Figure 10.1. After the closing of the switch, approximately when will Vc reach 6 V?

Approx τ since @ $t = \tau$, $V_c(t) = 0.632 V_{TH}$

$\approx$ 500 ms

Actual calc: $V_c(t) = 6V = V_{TH}(1 - e^{-t/\tau})$

$6 = 10(1 - e^{-t/0.5})$

$0.4 = e^{-t/0.5}$

$t = 458.1$ ms

5. See Figure 10.1. What is the maximum instantaneous current that will flow through the capacitor after the closing of the switch (assuming that Vc(0) = 0V)?

$I_{MAX} = i_c(t)\Big|_{t=0}$

$= \frac{E}{R} = \frac{10V}{10k\Omega} =$ 1mA

KEY

1. 2μF
2. 13.5 mS
3. 0.5 SEC
4. 0.5SEC (458 mS)
5. 1.0 mA