

# THIRD MIDTERM

# 1

Name: \_\_\_\_\_

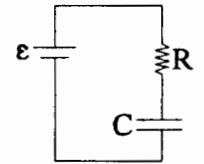
Discussion Instructor (circle): Billeter      Blake      Gillman      Herring

Student ID #: \_\_\_\_\_

**REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!**

**Use the conversion constants and data given on the front page.**

- (a) Calculate the time constant for a circuit containing a 11.0 pF capacitor and a 22,500 ohm resistor in series.

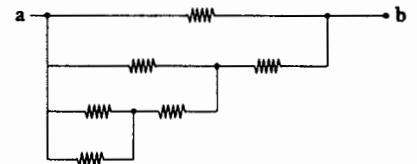


$$\tau = R \cdot C = 2.475 \times 10^{-7} \text{ sec}$$

- (b) Electrons from the sun arrive at earth with a velocity of  $1.00 \times 10^7$  m/s. What is the radius of their orbit in a magnetic field of 1.00 gauss?

$$r = \frac{mv}{q \cdot B} = 0.569 \text{ m}$$

- (c) What is the equivalent resistance between a and b if all resistors have the value R.



$$\frac{8}{13} R$$

- (d) If the internal resistor of a 12.0 volt car battery is 0.01 ohm, calculate the power dissipated in the internal resistance when the battery is connected to a load of 0.02 ohms.

$$P = I^2 \cdot R = (400)^2 \cdot (0.01) = 1600 \text{ W}$$

- (e) Calculate the drift velocity for electrons in a copper wire whose diameter is 1.20 mm if the wire is carrying a current of 7.75 A. [ $n = 8.47 \times 10^{28} \text{ e/m}^3$ ]

$$V_d = \frac{I}{n \cdot A \cdot q} = 5.06 \times 10^{-4} \text{ m/s}$$