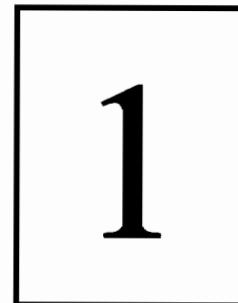


THIRD MIDTERM



Name: _____ Student ID #: _____

Discussion Instructor (circle): Eric Gary Jose Monica

REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

- (a) Calculate the magnetic field (in Tesla) 0.015 m from the center of long, straight wire carrying a current of 16.2 A.

$$B = \frac{\mu_0 I}{2\pi r} = 2.16 \times 10^{-4} \text{ T}$$

- (b) Calculate the force due to the earth's magnetic field on 150 m of electric power line when the current is 1670 A if the earth's is 0.75 gauss and is perpendicular to the power line.

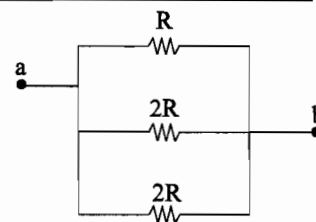
$$1 \text{ T} = 10^4 \text{ gauss} \quad F = I l B = 18.8 \text{ N}$$

- (c) Find the radius of the path of a proton ($m = 1.67 \times 10^{-27} \text{ kg}$) in a magnetic field of 0.11 gauss, if its velocity perpendicular to the field is $4.20 \times 10^5 \text{ m/s}$.

$$F = qvB = \frac{mv^2}{r} \quad r = \frac{mv}{qB} = 399 \text{ m}$$

- (d) If $R = 375 \text{ ohms}$, calculate the power dissipated by the top resistor if a battery of 155 volts is applied between a and b.

$$P = \frac{V^2}{R} = 64.1 \text{ W}$$



- (e) Calculate the charge on the capacitor 1.50 time constants after the switch is closed. $\epsilon = 175 \text{ V}$; $R = 275 \Omega$; $C = 15 \text{ pF}$

$$q(t) = C\epsilon(1 - e^{-t/\tau}) = 2.04 \times 10^{-9} \text{ C}$$

