

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
 PHYSICS DEPARTMENT
 PHYS 201- Term 112
 QUIZ #3 - CHAPTER 32

Tuesday 05 March 2012

Name: _____

Key

ID#: _____

1. A capacitor with parallel circular plates of radius $R = 2.0$ cm is discharging via a current of 20 A.
 - (a) Calculate the induced magnetic field at a distance $r = 1.0$ cm from the central axis of the capacitor.
 - (b) Calculate the induced magnetic field at a distance $r = 4.0$ cm from the central axis of the capacitor.
 - (c) Calculate the maximum induced magnetic field.
 - (d) Plot a graph of B induced versus r and explain your results of part a and b.

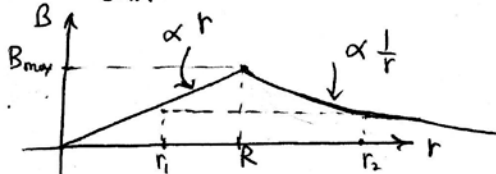
a) $\oint \vec{B} \cdot d\vec{s} = \mu_0 i_{d,enc}$ $\frac{i_{d,enc}}{A_{enc}} = \frac{i_d}{A} \Rightarrow i_{d,enc} = i_d \frac{A_{enc}}{A} = i_d \frac{\pi r^2}{\pi R^2}$

$$B(2\pi r) = \frac{\mu_0 i_d \pi r^2}{\pi R^2} \Rightarrow B_{in} = \frac{\mu_0 i_d}{2\pi R^2} r = \frac{4\pi \times 10^{-7} \times 20 \times (0.01)}{2\pi (0.02)^2} = 10^{-4} T$$

b) $\oint \vec{B} \cdot d\vec{s} = \mu_0 i_d \Rightarrow B(2\pi r) = \mu_0 i_d$

$$B_{out} = \frac{\mu_0 i_d}{2\pi r} = \frac{4\pi \times 10^{-7} \times 20}{2\pi \times (0.04)} = 10^{-4} T$$

c) $B_{max} = \frac{\mu_0 i_d}{2\pi R} = 2 \times 10^{-4} T$



2. A magnet in the form of a cylindrical rod has a length of 5.0 cm and a radius of 1.0 cm. It has a uniform magnetization of 5300 A/m. What is the magnetic dipole moment of the magnet?

$$M = \frac{\mu_{total}}{Volume}$$

$$Volume = \pi R^2 l$$

$$\mu_{total} = M V = 5300 \times \pi \times (0.01)^2 \times (0.05) = 0.08 \text{ A}\cdot\text{m}^2$$