PHYS 2102

Exam 3

Fall 2003

Dr. Aktas

Name :_____

SS # : _____

You have five questions, 20 points each.

This is a closed book exam. I understand I am not to use any notes or information other than on this exam sheet. I may use a pocket calculator but only for the purpose of numerical calculation. I accept the responsibility to know and observe the requirements of the UNC-Charlotte Code of Student Academic Integrity.

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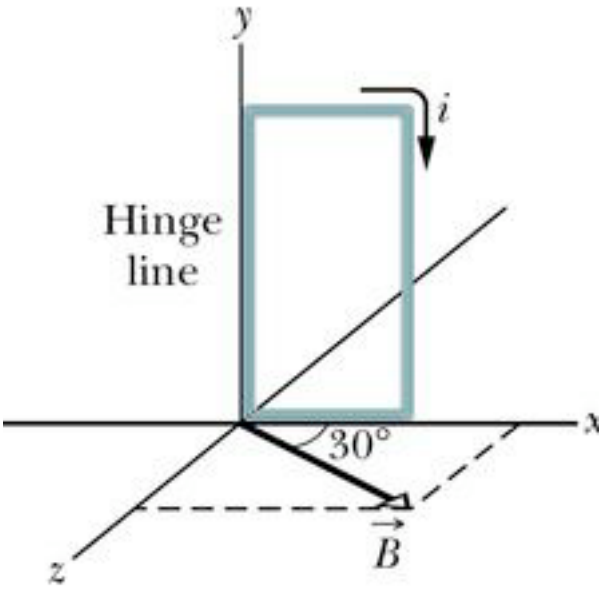
Signature

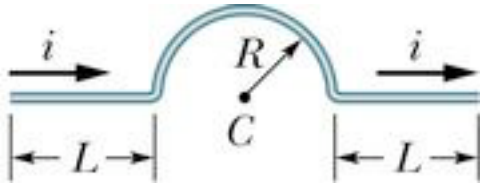
Good luck

Show all of your work. Do not skip steps. First write down the relevant equations then substitute the numbers if necessary.

1. Figure below shows a rectangular 20-turn coil of wire, of dimensions 10 cm by 5.0 cm. It carries a current of 0.10 A and is hinged along one long side. It is mounted in the xy plane, at 30° to the direction of a uniform magnetic field of magnitude 0.50 T. Find the magnitude and direction of the torque acting on the coil about the hinge line.

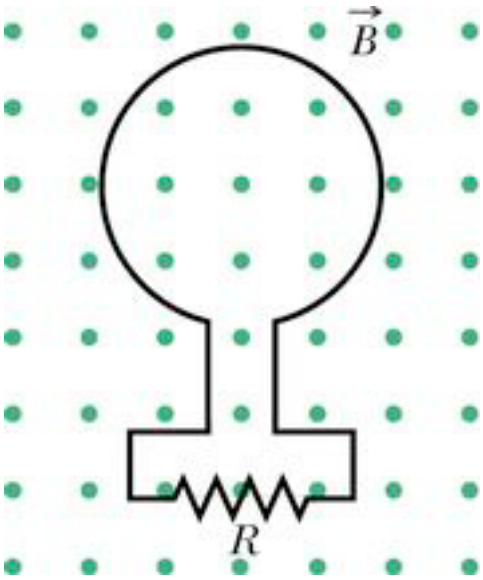


2. The wire shown in Fig. below carries current i. What magnetic field is produced at the center C of the semicircle by (a) each straight segment of length L, (b) the semicircular segment of radius R, and (c) the entire wire?



3. The current density inside a long, solid, cylindrical wire of radius a is in the direction of the central axis and varies linearly with radial distance r from the axis according to $J = J_0 r/a$. Find the magnetic field inside the wire.

4. The magnetic flux through the loop shown in Fig. below increases according to the relation $\Phi_B = 6.0t^2 + 7.0t$, where Φ_B is in milliwebers and t is in seconds. (a) What is the magnitude of the emf induced in the loop when t = 2.0 s? (b) What is the direction of the current through R?



5. A standing wave results from the sum of two transverse traveling waves given by

$$y_1 = 0.050\cos(\pi x - 4\pi t)$$

and

$$y_2 = 0.050\cos(\pi x + 4\pi t),$$

where x, y_1, and y_2 are in meters and t is in seconds. (a) What is the smallest positive value of x that corresponds to a node? (b) At what times during the interval $0 \le t \le 0.50$ s will the particle at x = 0 have zero velocity?