

PHYS 2102

Exam 3

Spring 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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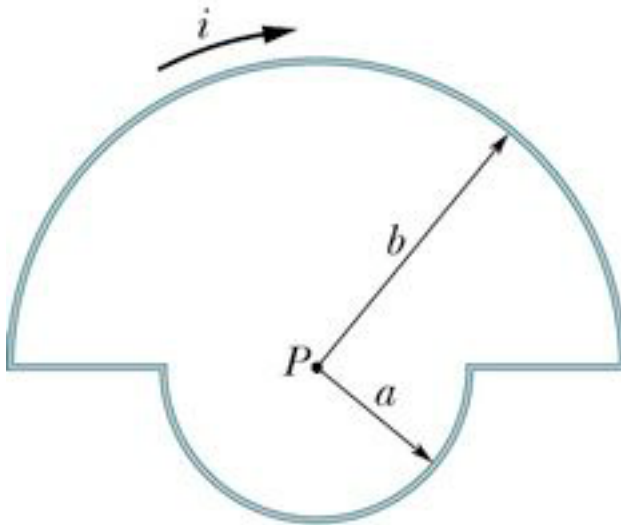
Signature

Good luck

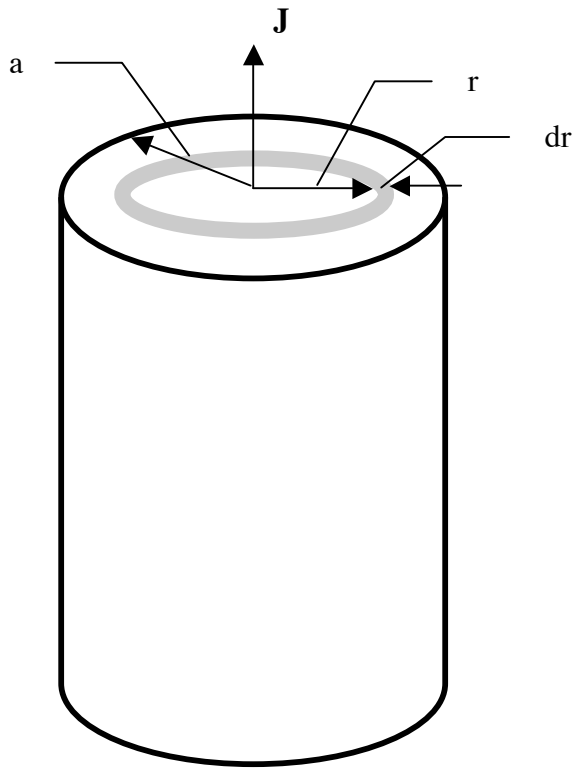
Show all of your work. Do not skip steps. First write down the relevant equations then substitute the numbers if necessary.

1. How many time constants must elapse for an initially uncharged capacitor in an RC series circuit to be charged to 99.0% of its equilibrium charge?

2. A length of wire is formed into a closed circuit with radii a and b , as shown in Fig. below, and carries a current i . (a) What are the magnitude and direction of \vec{B} at point P ? (b) Find the magnetic dipole moment of the circuit.



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. (Hint: Assume that the current density is constant through an incremental ring of thickness dr , which is concentric with the cylinder).



4. What uniform magnetic field, applied perpendicular to a beam of electrons moving at 1.3×10^6 m/s, is required to make the electrons travel in a circular arc of radius 0.35 m? $e = 1.6 \times 10^{-19}$ C.

5. Calculate the magnetic field of a toroid with N number of turns and carrying current i . What is the magnetic field outside of the toroid? Why? Explain your answer.