PHYS 2102

Exam 2

Spring 2004

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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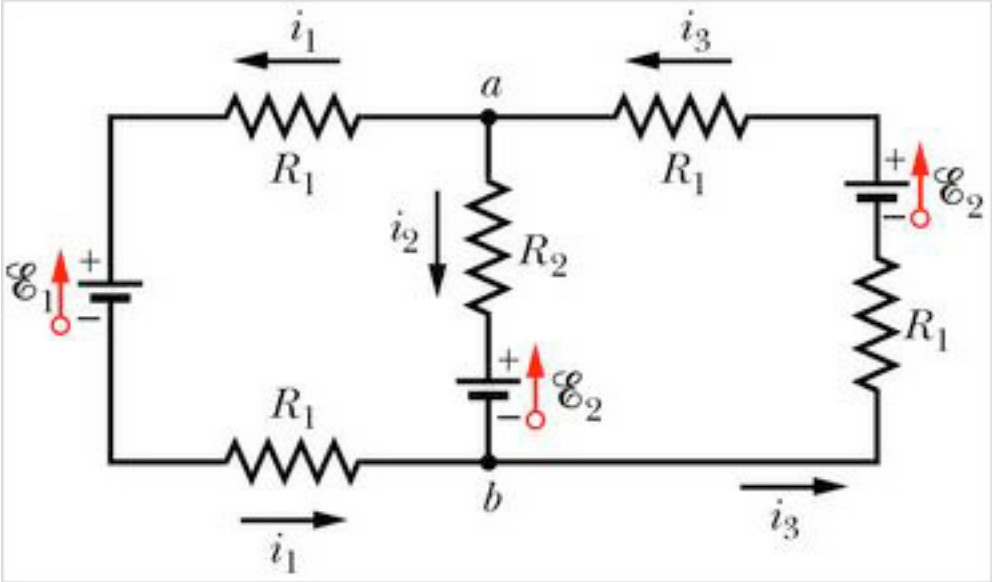
Signature

Good luck

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

1. Below figure shows a circuit whose elements have the following values:
$\mathscr{E}_1 = 3.0\,\text{V}, \mathscr{E}_2 = 6.0\,\text{V}, R_1 = 2.0\Omega, R_2 = 4.0\Omega.$

The three batteries are ideal batteries. Find the magnitude and direction of the current in each of the three branches.

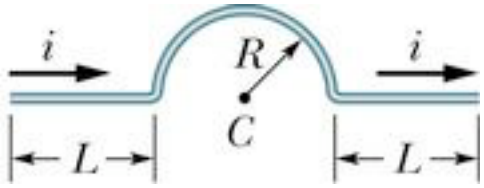


2. An electron with charge -1,6 x 10^{-16} C and velocity

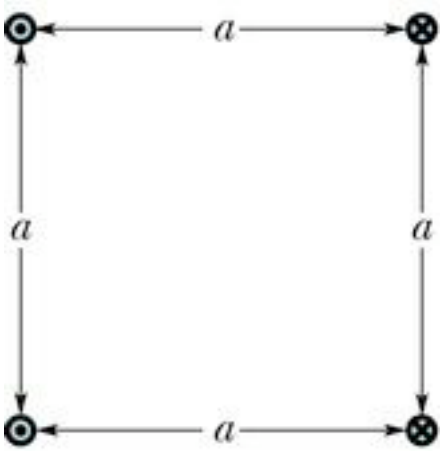
$$\vec{v} = (2.0 \times 10^{6}\,\mathrm{m/s})\hat{i} + (3.0 \times 10^{6}\,\mathrm{m/s})\hat{j}$$

moves through the magnetic field $\vec{B}$ = (0.030 T) $\hat{i}$ - (0.15 T) $\hat{j}$. (a) Find the force on the electron. (b) Repeat your calculation for a proton having the same velocity.

3. 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?



4. Four long copper wires are parallel to each other, their cross sections forming the corners of a square with sides a = 20 cm. A 20 A current exists in each wire in the direction shown in Fig. below . What are the magnitude and direction of $\vec{B}$ at the center of the square?



5. 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.

6. In Fig. below , the square loop of wire has sides of length 2.0 cm. A magnetic field is directed out of the page; its magnitude is given by $B = 4.0t^2y$, where B is in teslas, t is in seconds, and y is in meters. Determine the emf around the square at t = 2.5 s and give its direction.