PHYS 2102

Exam 2

Fall 2006

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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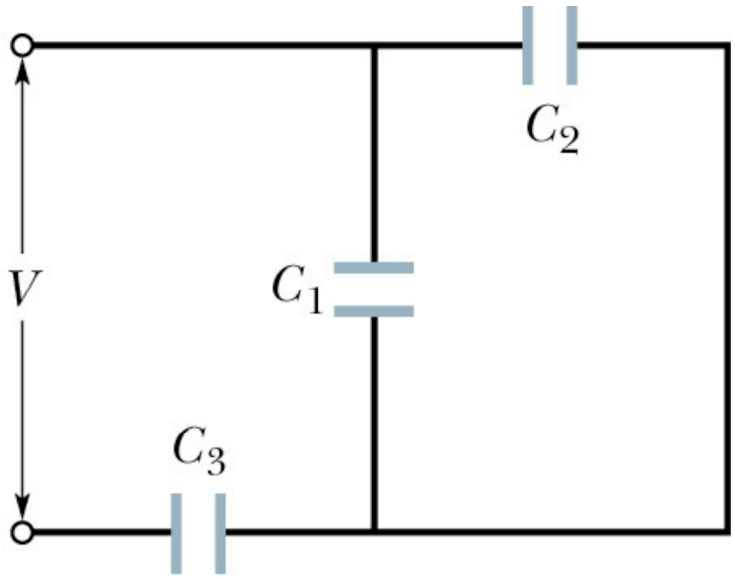
Signature

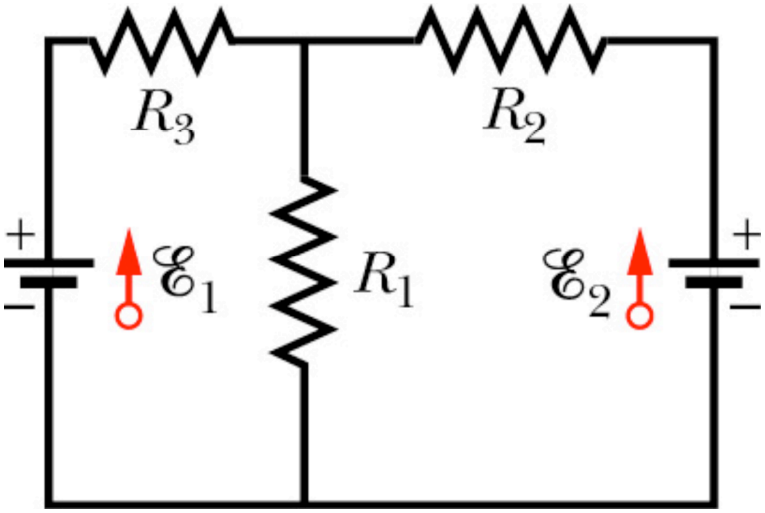
Good luck

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

1. In circuit below, find (a) the charge, (b) the potential difference, (c) the stored energy for each capacitor. Assume V = 100 V, C_1 = 10 μF, C_2 = 5.0 μF, C_3 = 4.0 μF.

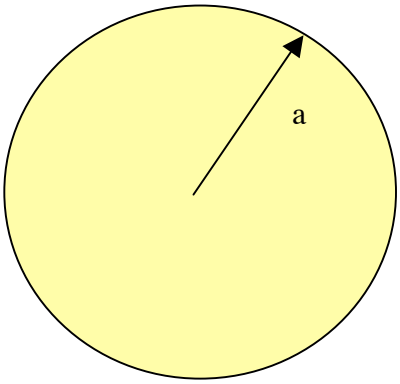


2. In circuit below $\varepsilon_1 = 3.0$ V, $\varepsilon_2 = 1.0$ V, $R_1 = 5.00\ \Omega$, $R_2 = 2.00\ \Omega$, , $R_3 = 4.00\ \Omega$, and both batteries are ideal. What is the rate at which energy is dissipated in (a) R_1, (b) R_2, and (c) R_3? What is the power of (d) battery 1 and (e) battery 2?

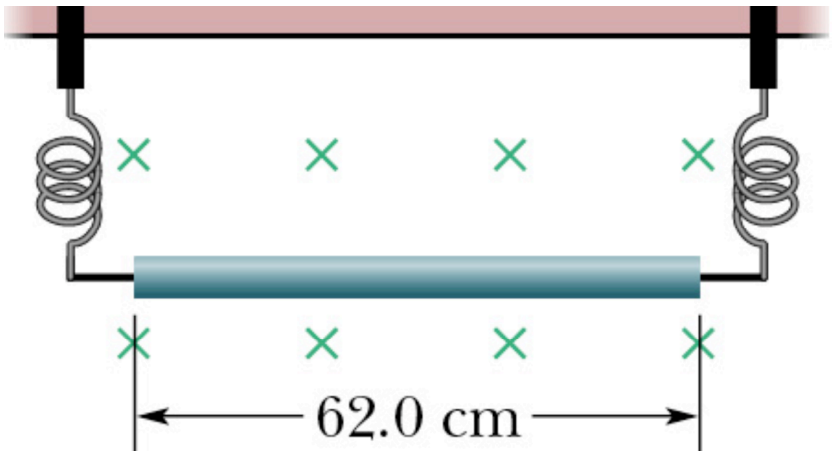


3. A circular coil of 160 turns has a radius of 1.90 cm. (a) Calculate the current that results in magnetic dipole moment of 2.30 A . m^2. (b) Find the maximum torque that the coil, carrying this current, can experience in the uniform 35 mT magnetic field.

4. Figure below shows a cross section of long cylindrical conductor of radius a, carrying a uniformly distributed current i. Calculate the magnetic field B(r) for the regions (a) $r < a$, and (b) $r > a$. Show your all steps.



5. A wire of 62.0 cm length and 13.0 g mass is suspended by a pair of flexible leads in uniform magnetic field of magnitude 0.440 T. What are the magnitude and direction of flow of current required to remove the tension in the supporting leads?



$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$$

$$\vec{E} = \frac{\vec{F}}{q}, \quad E = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}$$

$$\oint_S \vec{E} \bullet d\vec{A} = \frac{q_{enc}}{\varepsilon_0}$$

$$V = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$$

$$E_x = -\frac{\partial V}{\partial x}, \quad E_y = -\frac{\partial V}{\partial y}, \quad E_z = -\frac{\partial V}{\partial z}$$

$$P = i^2 R, \quad P = iV, \quad R = \frac{V}{i}, \quad J = \frac{i}{A}$$

$$C = \frac{q}{V}, \quad U_E = \frac{1}{2}CV^2 = \frac{1}{2}qV = \frac{1}{2}\frac{q^2}{C}$$

$$\vec{B} = \frac{\mu_0}{4\pi}\int \frac{id\vec{l} \times \vec{r}}{r^3}$$

$$\oint_C \vec{B} \bullet d\vec{l} = \mu_0 i_{enc} \quad \mu_0 = 4\pi \times 10^{-7} Tm/A$$

$$\vec{F} = \int id\vec{l} \times \vec{B}, \quad \vec{F} = q\vec{v} \times \vec{B}, \quad \vec{\mu} = Ni\vec{A}, \quad \vec{\tau} = \vec{\mu} \times \vec{B}$$