EXAM II Physics 208 2015

Last Name.....First Name.....Section Number.....

USEFUL INFORMATION

For two point particles

$$\vec{F} = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r^2}\hat{r}$$

$$\frac{d\vec{r}}{dt} = \frac{dx}{dt}\vec{i}_x + \frac{dy}{dt}\vec{i}_y = \frac{dr}{dt}\vec{i}_r + r\frac{d\theta}{dt}\vec{i}_\theta$$

$$V(\vec{r}_2) - V(\vec{r}_1) = -\int_{\vec{r}_1}^{\vec{r}_2} \vec{E}\cdot d\vec{r}$$

$$C = \frac{Q}{V} \qquad R = \rho\frac{l}{A}$$

$$\oint \vec{E}\cdot d\vec{S} = \frac{Q_{inside}}{\epsilon_0}$$

$$V = iR \qquad \vec{E} = \rho\vec{j}$$

For parallel plates $C = \frac{A\epsilon_0}{d}$

WARNING: In any circuit problem, failure to indicate the direction of currents and/or the failure to indicate where charges are located on capacitors will result in no credit being given.

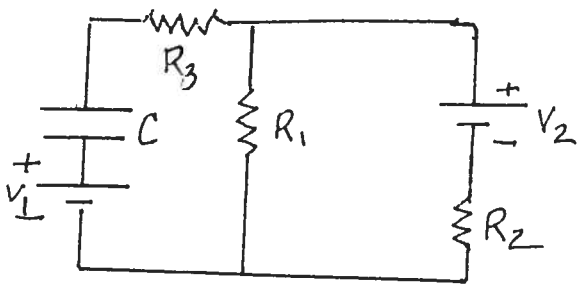
1.

2.

3.

4.

1. (25 points)In the circuit below, all the $R's$, C and the $V's$ are known. Find the currents in each resistor and the charges on the capacitor if the circuit was put together a long time ago. You must clearly indicate what you are doing or you will receive no credit!

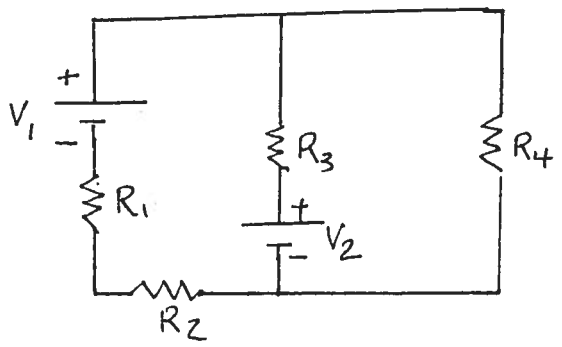


Laws or Definitions

Application

2 points Result: Evaluate each currents and the charges if $R_1 = 3\Omega$, $R_2 = 15\Omega, R_3 = 4\Omega$, $V_1 = 6volts$, $V_2 = 18volts$ and $C = 2\mu f$.

2. (25 points)In the circuit below, all the $R's$ and $V's$ are known. Obtain enough equations so that you could find the currents in each resistor if the circuit was put together a long time ago. You must clearly indicate what you are doing or you will receive no credit!

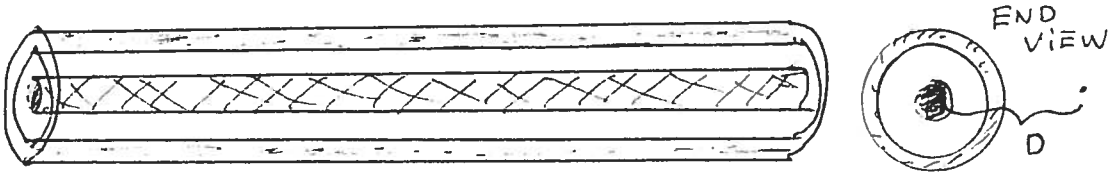


Laws or Definitions

Application

2 points Result: Find all currents if $R_1 + R_2 = R_3 = R_4 = 2\Omega$ and $V_1 = V_2 = 6volts$.

3. (25 points)A very, very long, cylinder has radius a and length L. It has a total charge of Q uniformly spread throughout its volume. It is inside a hollow, perfectly conducting cylinder of length L that has inner radius b and outer radius f.



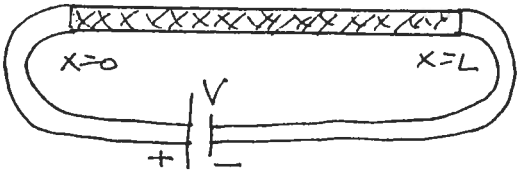
Find the difference in the electric potential between a point on the axis and a point a distance D from the axis of the cylinders.

Laws or Definitions

Application

Result: Evaluate the difference in electrical potential if $b = 2a$ and $D = 2f$.

4. (25 points) A wire has length L and cross sectional area a. Its resistivity varies with x, defined in the figure, according to $\rho(x) = \rho_0 \frac{x}{L}$ where ρ_0 is a known constant. It is connected to a battery with voltage V by wires with zero resistivity. Find the current that will flow through the wire and the charge in the wire between $x = \frac{L}{4}$ and $x = \frac{L}{2}$.



Laws or Definitions

Application

Result