EXAM II Physics 208 2014

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 charge is located on capacitors will result in no credit being given.

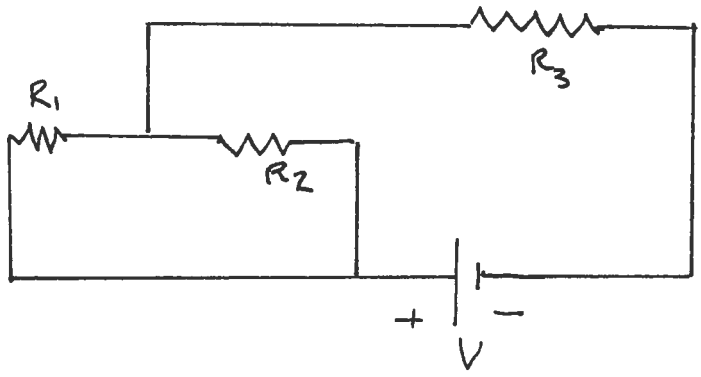
1.

2.

3.

4.

1. (25 points)In the circuit below, all the $R's$, 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!

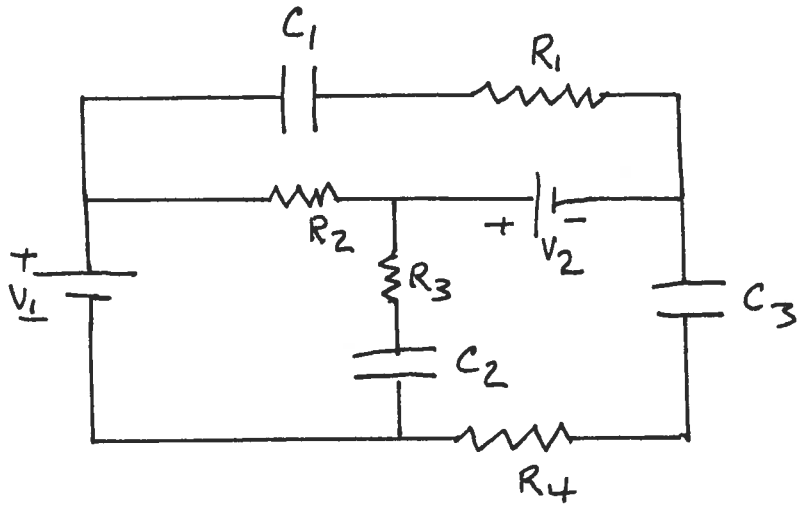


Laws or Definitions

Application

2 points Result: Find each current if $R_1 = 3\Omega$, $R_2 = 6\Omega$,$R_3 = 4\Omega$, and $V = 6volts$.

2. **(25 points)In the circuit below, all the $R's$, $C's$ and $V's$ are known. Obtain enough equations so that you could find the currents in each resistor and the charges on each 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!**

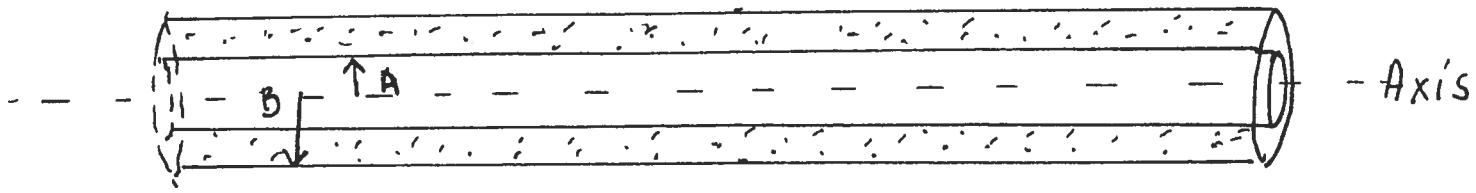


Laws or Definitions

Application

2 points **Result: Find all charges and currents if $R_1 = R_4 = 3\Omega$, $R_2 = R_3 = 6\Omega$, $C_1 = C_2 = 4\mu f$, $C_3 = 6\mu f$ and $V_1 = 6volts$ and $V_2 = 12volts$**

3. (25 points)A very, very long, hollow cylinder has inner radius A, outer radius B. It has a known uniform charge per unit volume ρ.



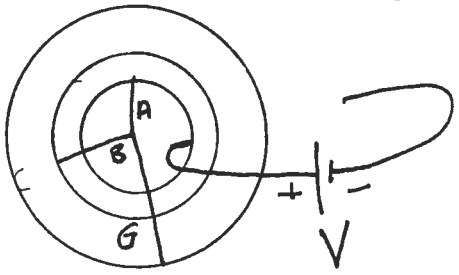
Find the difference in the electric potential between a point on the axis and a point a distance $A+D$ from the axis of the cylinder, where $A+D < B$.

Laws or Definitions

Application

Result: Find the difference in electrical potential if $D = A$.

4. (25 points)A spherical shell is made of material with constant resistivity ρ_0. The shell has inner radius A and outer radius B. It is inside a second spherical shell that has inner radius B and outer radius G. The second spherical shell is made of material with resistivity that varies with the distance from the center of the spheres, r, according to $\rho(r) = \rho_0 \frac{r^2}{G^2}$. The plus terminal of a battery is connected to the inner surface at A. Find the current that would flow if the minus terminal of the battery is connected to a point on the surface at B. Find the current that would flow if the minus terminal of the battery is instead connected to a point on the surface at G.



Laws or Definitions

Application

Result: Find each current if $B = 2A$ and $G = 4A$.