EXAM II Physics 208 2018

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.

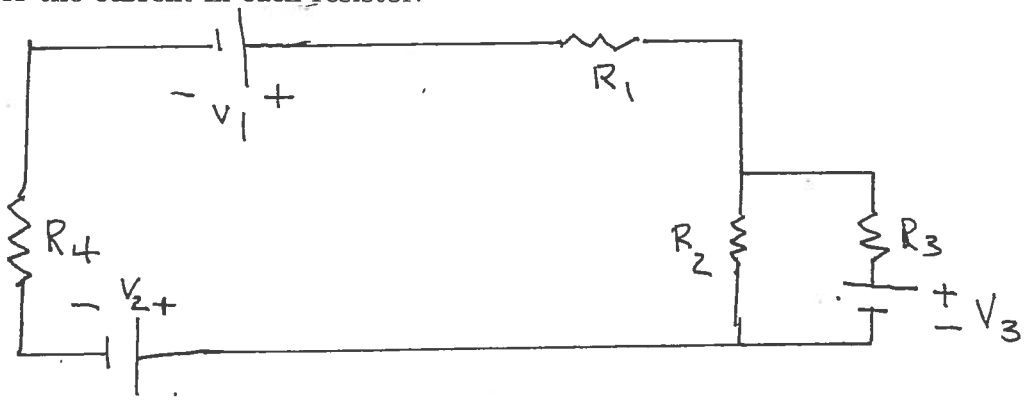
1.

2.

3.

4.

1. (25 points)In the circuit below, all the $R's$ and $V's$ are known. The circuit was put together a long time ago. Obtain a sufficient number of equations so that you could solve for the current in each resistor.

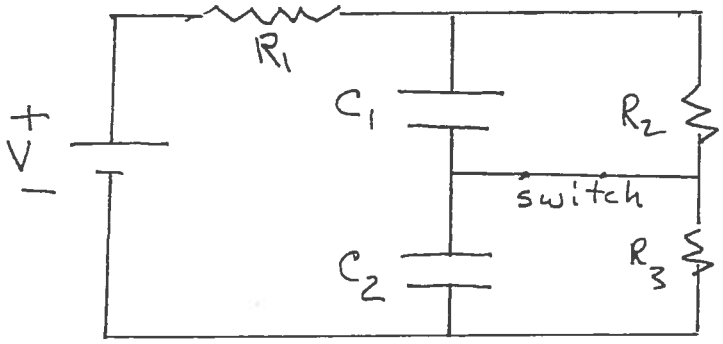


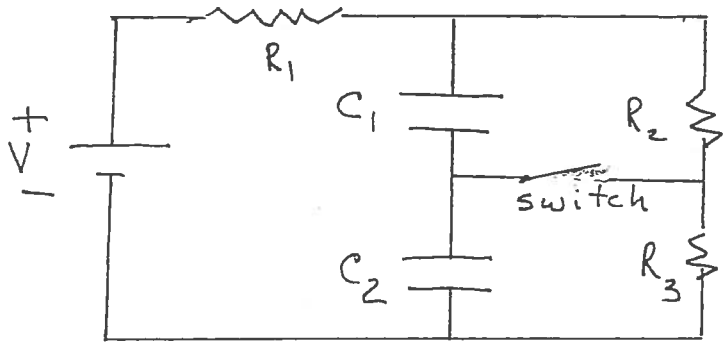
Laws or Definitions

Application

Result

2. (25 points)In the circuit below, all the $R's$, $C's$ and $V's$ are known. The circuit was put together a long time ago with the switch **closed**. Find the currents in each resistor and the charges on the capacitors. If the switch is then opened and a long time passes, obtain a sufficient number of equations so that you could solve for all currents and the charges on the capacitors.





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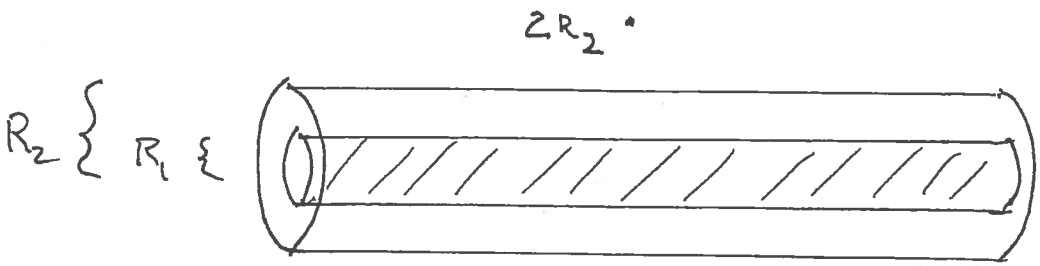
3. (25 points)An infinitely long insulating cylinder of radius R_1 has a charge uniformly spread throughout its volume so that the **charge per unit volume** is ρ. It is inside a conducting cylinder with inner radius R_1 and outer radius R_2.

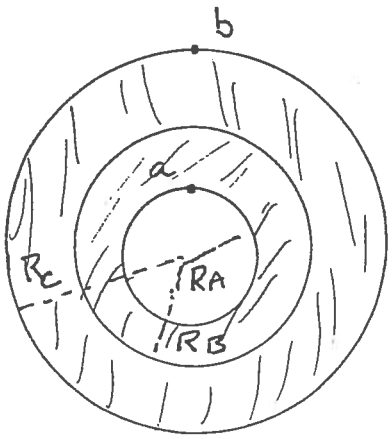


Find the difference in the electric potential between a point on the axis, at the center of the cylinder, and a point a distance $2R_2$ from the axis of the cylinder.
Laws or Definitions

Application

Result

4. (25 points) A spherical shell with inner radius R_A and outer radius R_B has resistivity ρ_1. It is inside a second spherical shell with inner radius R_B and outer radius R_C with resistivity ρ_2. A current i is flowing radially out uniformly through the two shells. Find difference in the electric potential between point a and b, marked on the figure.



Laws or Definitions

Application

Result