Exam 2

P208 Fall 2007,
Instructor: Prof. Abanov

10/15/07
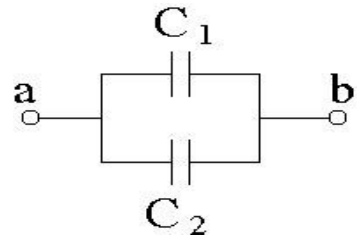
Name_____   Section_____

(print)

Your grade:

Problem 1.

A system of capacitors is shown on the figure, $C_1 = 2\mu F$,

 $C_2 = 3\mu F$. Potential difference between points a and b is

V=10Volts.

What is the charge Q_1 on capacitor C_1 ?_____

What is the charge Q_2 on capacitor C_2 ?_____

What is the total capacitance of the system?_____

Problem 2.

A system of capacitors is shown on the figure, $C_1 = 6\mu F$,

 $C_2 = 3\mu F$. Potential difference between points a and b is V=10Volts.

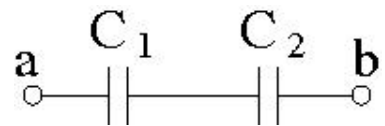**What is the total capacitance of the system?**_____

What is the charge Q_1 on capacitor C_1 ?_____

What is the charge Q_2 on capacitor C_2 ?_____

What is the voltage difference V_1 across the capacitor C_1 ?_____

What is the voltage difference V_2 across the capacitor C_2 ?_____

Problem 3.

A battery with $E=10V$ and internal resistance $r=1k\Omega$ is connected to a simple circuit with a total resistance of $R=9k\Omega$.

What is the current through the battery?_____

What is the potential difference between the battery's terminals?_____

How much power does the battery supply to the simple circuit?_____

How much power dissipates inside the battery?_____

Problem 4.

In the circuit shown in the picture $E=10V$, $r=1k\Omega$, $R_1=2k\Omega$, and $R_2=R_3=R_4=3k\Omega$.

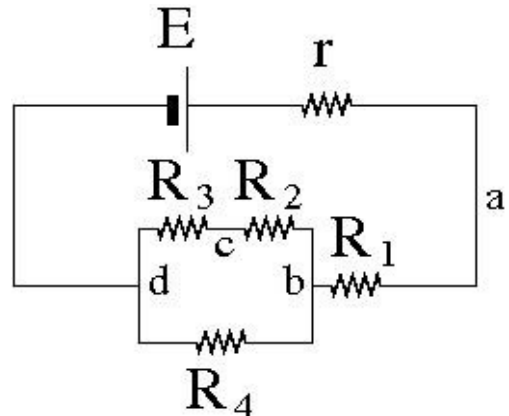**What is the current at point a of the circuit?_____**

What is the potential difference between points a and b?_____

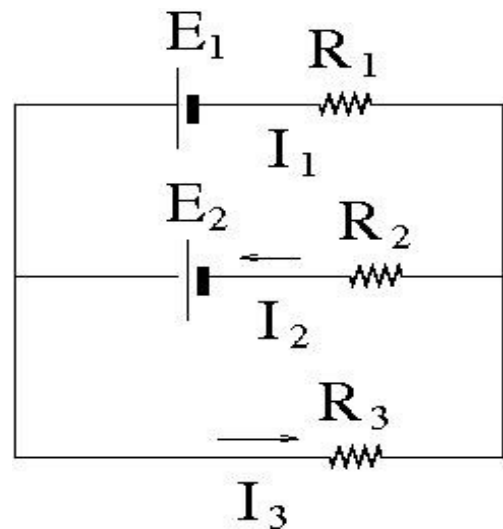**What is the potential difference between points b and d?_____**

What is the the the current at point c?_____

What is the potential difference between points c and b?_____

Problem 5.

In the circuit shown in the figure $E_1=28V$, $R_2=6\Omega$, $R_3=3\Omega$, $I_2=4A$, and $I_3=6A$ (directions of I_2 and I_3 are shown)
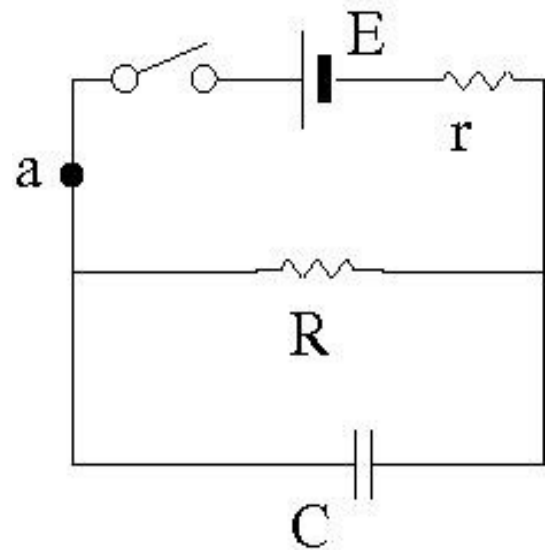
What is the magnitude and direction (show in the figure) of the current I_1 **?_____**

What is the value of the resistor R_1 **?_____**

What is E_2 **?_____**

Problem 6.

In the circuit shown in the figure $E=10V$, $r=6k\Omega$, $R=4k\Omega$, and $C=4\mu F$. Initially the capacitor is uncharged. At the moment t_0 the switch is closed.
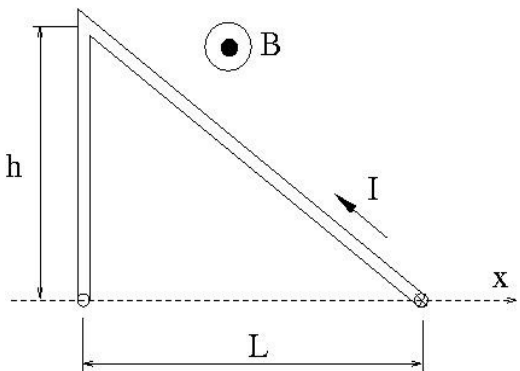
What is the current in point a immediately after t_0 **?_____**

What is the current in point a after a very long time? _____

What is the charge on the capacitor C **long time after** t_0 **?_____**

Problem 7.

A wire with a current $I=2\text{mA}$ has the form shown in the figure with dimensions $L=10\text{cm}$ and h unknown. It was placed in the magnetic field $B=0.5\text{T}$ pointing out of the paper.

What is x component of the force acting on the wire?___

What is y component of the force acting on the wire?_____

Problem 8.

A planar loop of area $A=0.05\text{m}^2$ carries a current $I=1\text{A}$. The magnetic field $B=0.5\text{T}$ is at angle $45°$ with the norm to the loop.

What is magnetic moment of the loop?_____

What torque should be applied to the loop in order to keep it at rest?_____

What torque would be needed if the loop had 100 turns?

Problem 9.

An electron $e = 1.6 \times 10^{-19} C$, $m_e = 9.1 \times 10^{-31} kg$ is accelerated through a potential difference of $2kV$. It then passes into magnetic field perpendicular to its path, where it moves in a circular arc of diameter $0.36m$

What is the magnitude of the velocity of the electron in magnetic field?_____

What is the magnitude of the magnetic field?_____

What is the frequency of he electron's motion in the magnetic field?_____

Problem 10.

In the circuit shown on the figure $R_1 = 2\Omega$, $R_2 = 6\Omega$, and $R_3 = 5\Omega$.

What the resistance of the resistor R_4 must be for the potential difference between the points a and b to be 0 ?_____