PHYS-2201 Electricity and Magnetism
Assignment 11
Due: Tuesday, Jan. 19, 2015, by 3pm (at dropbox outside 3L24)

1. (5 points) Three equal resistors (R) are connected to a power supply as shown in the left circuit of FIG. 1. When the switch S is opened after having been closed for a long time, what happens to:

   (a) the voltage drop across each resistor,

   (b) the current flow through each resistor, and

   (c) the terminal voltage of the battery?

   (d) If the emf of the battery is 9.0 V, what is the terminal voltage when the switch is closed if the internal resistance is 2.50 Ω and $R = 12.5$ Ω?

   (e) Using the same numbers, what is the terminal voltage after the switch is opened again?

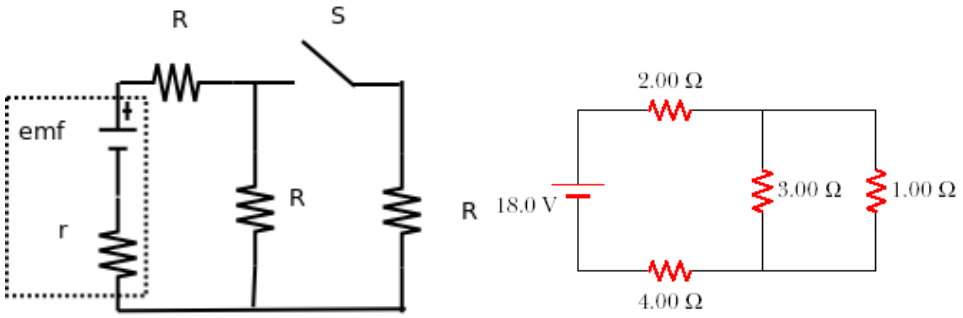

Figure 1: Problem 1 (left), and problem 2 (right).

2. (5 points) Calculate the power delivered to each resistor of the circuit on the right in FIG. 1.

3. (5 points) Solve for the currents in each of the resistors in FIG. 2 by hand. Use $R_1 = 5$ Ω, $R_2 = 15$ Ω, $R_1 = 5$ Ω, $R_3 = 8$ Ω, $R_4 = 3$ Ω, $R_5 = 2$ Ω, $V_1 = 3$ V, $V_2 = 6$ V, and $V_3 = 9$ V.

4. (5 points) The switch S has been closed for a long time, and the electric current shown in FIG. 3 carries a constant current. The values of the components in the circuit are $C_1 = 2.10$ μF, $C_2 = 3.50$ μF, $R_1 = 2.80$ kΩ, and $R_2 = 1.70$ kΩ. The power delivered to R_2 is 2.5 W.

   (a) Find the charge on C_1.

   (b) Now the switch is opened. After 1.5 ms, by how much has the charge on C_2 changed?

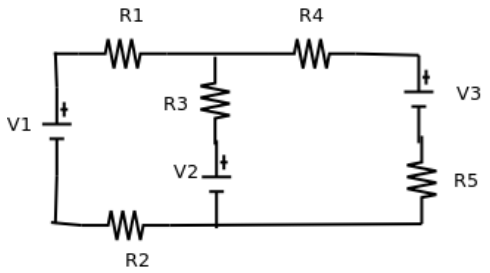

Figure 2: Problem 3.

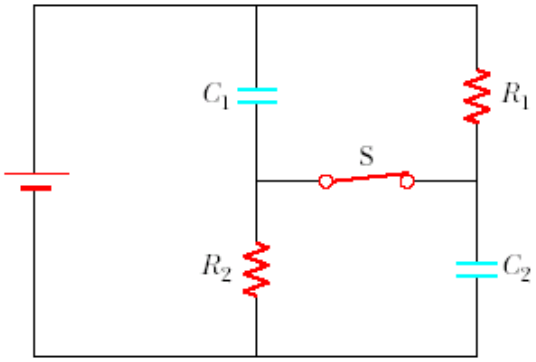

Figure 3: Problem 4.

5. (5 points) Determine the current through the switch as a function of time when the switch in the circuit in FIG. 4 is closed, after having been open for a long time. Write down the current in terms of V_{in}, R_1, R_2, and C, then plug in the values. How much energy is stored in the capacitor when it is fully charged?

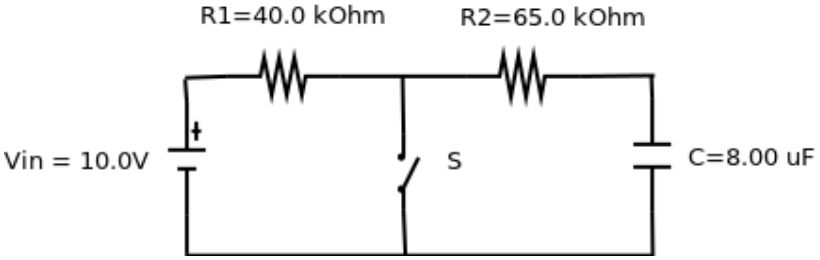

Figure 4: Problem 5.