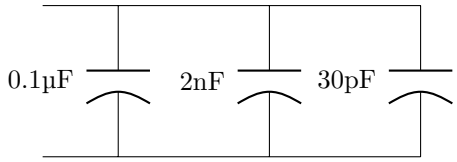
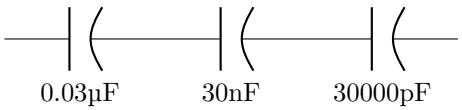
Important Remarks

- Homework is due on Sept. 17th, 2013 at the beginning of class
- **For all problems, keeping your work in fractions will produce easier, more accurate results.**
- Start early and get help if you need it
- Start a new page per problem
- Show all the work
- Specify all the units
- Circle your answers
- Staple pages

1. The figure below shows a number of capacitors connected in parallel. Redraw this circuit as a single capacitor equivalent to this combination, and calculate its value C_{eq}. **Don't round off your answer**.



2. The figure below shows a number of capacitors connected in series. Redraw this circuit as a single capacitor equivalent to this combination, and calculate its value C_{eq}.



3. For the circuit shown in Figure 1, assume $Vs = 5$V and R is unknown. In the lab we observe the charge curve for this circuit on an oscilloscope. We measure the following:

   $V_c = 0.5$V when $t = 50$µs
   $V_c = 4.5$V when $t = 1150$µs

   (a) Using the 10% - 90% rise time rule of thumb, calculate the time constant τ for this circuit.

   (b) Using your results from part a, determine the value of R.

   (c) Assume the switch has been in position A for a long time and switches to B at $t = 0$. Plot V_C for $0 < t < 4\tau$ using at least four points. Show all your work! Be sure to plot and confirm that your 10% values and 90% values match those used earlier. (Remember that the rule of thumb for the earlier calculation is an approximation).

   (d) Assume the switch has been in position B for a long time and switches to A at $t = 0$. Plot V_C for $0 < t < 4\tau$ using at least four points. Show all your work! Be sure to plot and confirm that your 10% values and 90% values match those used earlier. (Remember that the rule of thumb for the earlier calculation is an approximation).

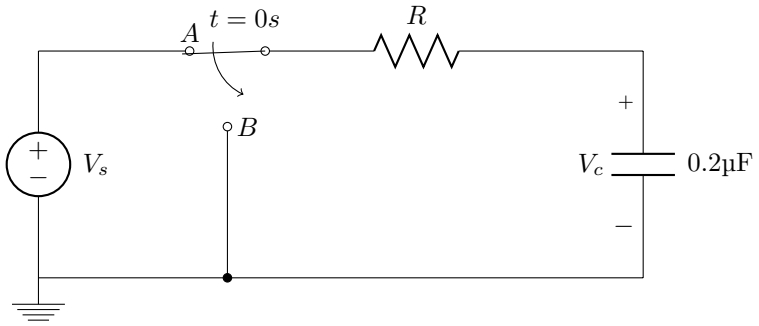


Figure 1: Circuit for problem 3

4. For the circuit shown in Figure 2: $\tau = 2\text{ms}$, $V_s = 15\text{V}$.

   (a) Determine the value of C.

   (b) Assume the switch has been in position A for a long time and switches to B at $t = 0$. Plot V_{ceq} for $0 < t < 4\tau$ using at least four points. Show all your work!

   (c) Assume the switch has been in position B for a long time and switches to A at $t = 0$. Plot V_{ceq} for $0 < t < 4\tau$ using at least four points. Show all your work!

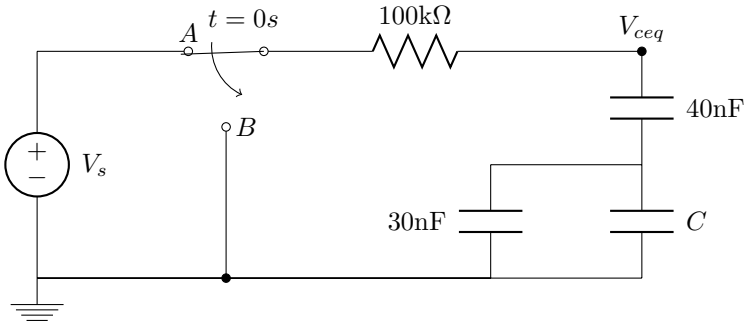


Figure 2: Circuit for problem 4