

[dc circuits + capacitance] .quiz

1) ammeters and voltmeters

Consider an ideal voltmeter and an ideal ammeter, connected to a circuit like Fig. 1. The numerical values are $E = 4.00 \text{ V}$, $R_1 = 100 \Omega$, $R_2 = 200 \Omega$, and $R_3 = 300 \Omega$.

- Draw this circuit again, putting short circuits, i.e. simply wires, and/or open circuits instead of the meters.
- Find the current passing through R_2 .
- Find the current passing through the ammeter and the voltage reading of the voltmeter.

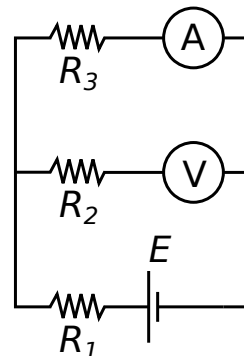


Figure 1: The circuit for the problem 2.

2) RC Circuits

Consider the RC circuit shown in fig. 1, where $R_1 = 5.0 \text{ k}\Omega$, $R_2 = 20 \text{ k}\Omega$, $C_1 = C_2 = 4.7 \text{ mF}$, and $\mathcal{E} = 12 \text{ V}$. The left switch is connected when $0 < t < T$, and the right switch is connected after that, i.e. $t > T$. Initially capacitors has no charge. For numerical values you can use $T = 60 \text{ s}$.

- Draw two circuits, one for $0 < t < T$, and the other one for $t > T$.
- Find $V_{c_1}(t)$ when $0 < t < T$. What is the time constant?
- What happens right after the moment $t = T$ when capacitors are connected in parallel?
- Find $V_{c_1}(t)$ when $t > T$.
- Qualitatively plot $V_{c_1}(t)$ versus time.

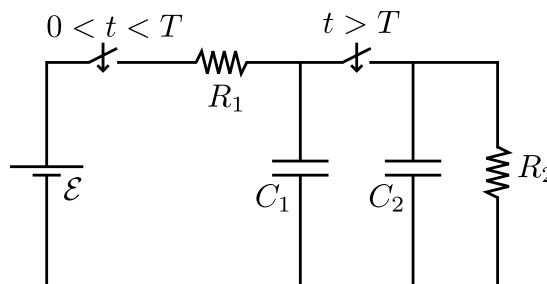


Figure 2: RC circuit, charging till $t = T$ and discharging after that.