

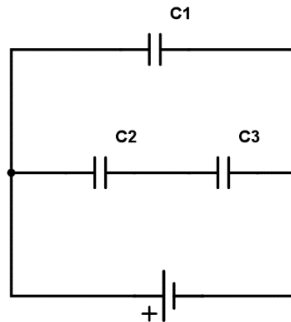
Capacitors in Circuits Homework

Physics

All problems taken from Physics, Giancoli, 2nd Ed. P. 436, #37, 41, 42, 47

1. (a) Determine the equivalent capacitance of the circuit below (your answer will be a variable expression). (b) If $C_1 = C_2 = 2C_3 = 4.0 \mu\text{F}$, how much charge is stored on each capacitor when $V = 50\text{V}$?

[(a) $C_{tot} = C_1 + \frac{C_2 C_3}{(C_2 + C_3)}$; (b) $Q_1 = 200 \mu\text{C}$, $Q_2 = 6.67 \mu\text{C}$, $Q_3 = 6.67 \mu\text{C}$]



2. A $0.20 \mu\text{F}$ and a $0.10 \mu\text{F}$ capacitor are connected in series to a 9.0V battery. Calculate (a) the potential difference across each capacitor, and (b) the charge on each. (c) Repeat parts (a) and (b) assuming the capacitors are in parallel. [(a) 3V , 6V ; (b) $0.6 \mu\text{C}$, $0.6 \mu\text{C}$; (c) 9.0V , 9.0V , $1.8 \mu\text{C}$, $0.9 \mu\text{C}$]
3. A $3.0 \mu\text{F}$ and a $4.0 \mu\text{F}$ capacitor are connected in series to a 9.0V battery and this combination is connected in parallel to a $2.0 \mu\text{F}$ capacitor. (a) What is the net capacitance? (b) if 50V is applied across the whole network, calculate the voltage across each capacitor. [(a) $3.71 \mu\text{F}$; (b) $V_3 = 28.6\text{V}$, $V_4 = 21.4\text{V}$]
4. Two resistors and two capacitors are arranged as in the circuit below. At its steady state (after the capacitors are fully charged), with a potential difference of 24V from the power source, (a) what is the potential at point a with the switch open? (b) What is the potential at point b with the switch open? (c) When the switch is closed, at the steady state of the circuit, what is the final potential of point b ? (d) How much charge flows through the switch when it is closed? [(a) 8V ; (b) 16V ; (c) 8V ; (d) $-5.8 \mu\text{C}$]

