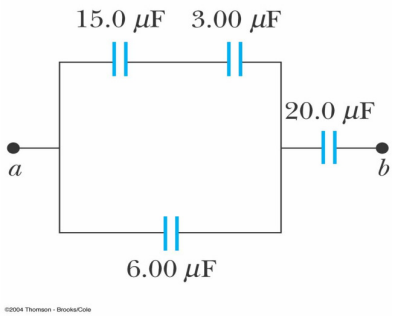
Chapter 26

Ex. 1

Four capacitors are connected as shown in Figure P26.21. (a) Find the equivalent capacitance between points *a* and *b*. (b) Calculate the charge on each capacitor if ΔV_{ab} = 15.0 V.



(a) $$\frac{1}{C_s}=\frac{1}{15.0}+\frac{1}{3.00}$$

$$C_s = 2.50\ \mu\text{F}$$

$$C_p = 2.50 + 6.00 = 8.50\ \mu\text{F}$$

$$C_{eq}=\left(\frac{1}{8.50\ \mu\text{F}}+\frac{1}{20.0\ \mu\text{F}}\right)^{-1}=\boxed{5.96\ \mu\text{F}}$$

(b) $$Q = C\Delta V = (5.96\ \mu\text{F})(15.0\ \text{V}) = \boxed{89.5\ \mu\text{C}}\ \text{on } 20.0\ \mu\text{F}$$

$$\Delta V=\frac{Q}{C}=\frac{89.5\ \mu\text{C}}{20.0\ \mu\text{F}}=4.47\ \text{V}$$

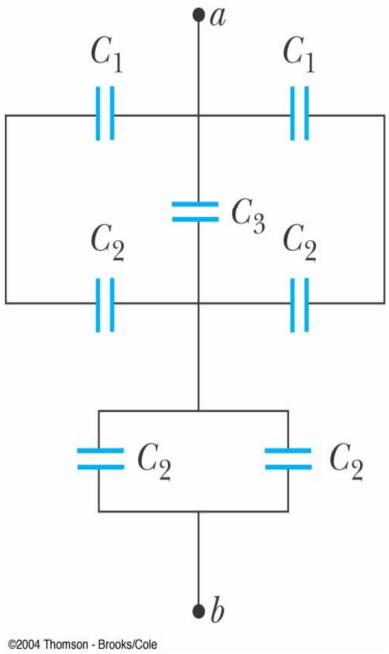
$$15.0 - 4.47 = 10.53\ \text{V}$$

$$Q = C\Delta V = (6.00\ \mu\text{F})(10.53\ \text{V}) = \boxed{63.2\ \mu\text{C}}\ \text{on } 6.00\ \mu\text{F}$$

$$89.5 - 63.2 = \boxed{26.3\ \mu\text{C}}\ \text{on } 15.0\ \mu\text{F}\ \text{and } 3.00\ \mu\text{F}$$

Ex. 2

Find the equivalent capacitance between points a and b for the group of capacitors connected as shown in the figure. Take: C1 = 5.00 µF, C2 = 10.0 µF, and C3 = 2.00 µF.



$$C_s=\left(\frac{1}{5.00}+\frac{1}{10.0}\right)^{-1}=3.33\ \mu\text{F}$$

$$C_{p1} = 2(3.33) + 2.00 = 8.66\ \mu\text{F}$$

$$C_{p2} = 2(10.0) = 20.0\ \mu\text{F}$$

$$C_{eq}=\left(\frac{1}{8.66}+\frac{1}{20.0}\right)^{-1}=\boxed{6.04\ \mu\text{F}}$$