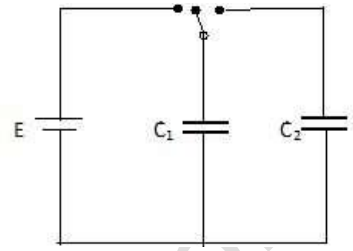
Q- Two capacitors are connected to a battery with a two way swatch as shown in figure. The capacitors are initially uncharged. When the switch is thrown to the left the capacitor C_1 = 10μF is charged to 50V. Now the switch is thrown to the right and the voltage across C_1 is drops to 35 V.



(a) Find the value of C_2.

(b) Find the final charge on each capacitor.

The capacitance of $C_1 = 10*10^{-6}$ F

The charge on the capacitor C_1 when connected to 50 V batteries will be

$$Q = C_1*V = 10*10^{-6}*50 = 5*10^{-4} \text{ C}$$

When the switch is shifted to right the battery is disconnected and the two capacitors are now connected in parallel. The potential difference between the plates is equal and the charge is distributed between them.

(a) The charge remained on the C_1 will be now

$$Q_1 = C_1V' = 10*10^{-6}*35 = 3.5*10^{-4} \text{ C}$$

Thus the charge on capacitor C_2 will be

$$Q_2 = Q - Q_1 = 5*10^{-4} \text{ C} - 3.5*10^{-4} \text{ C} = 1.5*10^{-4} \text{ C}$$

As the two capacitors are now in parallel, the potential difference across C_2 is also 35 V and hence its capacitance is given by

$$C_1 = Q_2/V' = 1.5*10^{-4} /35 = \mathbf{4.29*10^{-6} F}$$

(b) The charge on each capacitor is already calculated as

$$Q_1 = \mathbf{3.5*10^{-4} C}$$

And $Q_2 = \mathbf{1.5*10^{-4} C}$