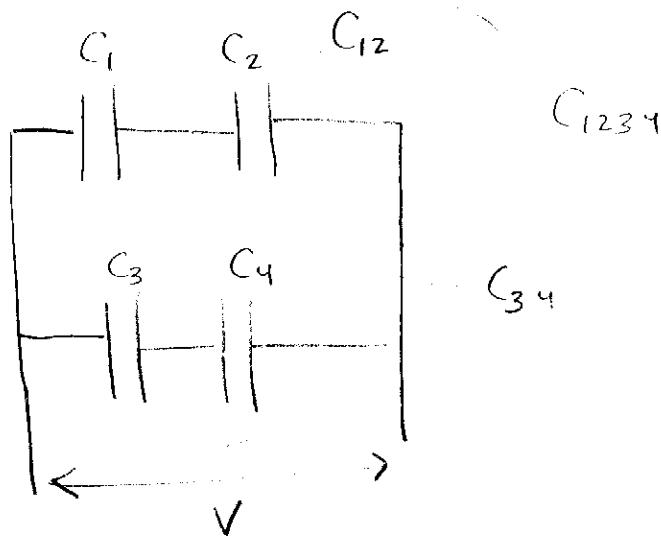


- 1) Find the equivalent capacitance,  $C_{eq}$
- 2) Find the charge  $Q_i$  and potential difference  $V_i$  for each capacitor  $i$ , in terms of  $C_i$ 's,  $V$ .



a)  $C_{12}$  is || with  $C_{34}$

$$C_{1234} = C_{12} + C_{34}$$

$C_{12}$  is  $C_1$  in series with  $C_2$

$$\frac{1}{C_{12}} = \frac{1}{C_1} + \frac{1}{C_2} \Rightarrow C_{12} = \frac{C_1 C_2}{C_1 + C_2}$$

Similarly, 
$$C_{34} = \frac{C_3 C_4}{C_3 + C_4}$$

$$C_{1234} = \frac{C_1 C_2}{C_1 + C_2} + \frac{C_3 C_4}{C_3 + C_4}$$

b)  $V$  is given

What we know:

$$V = V_{12} = V_{34}$$

12 and 34 in ||

$$C_{1234} = \frac{Q_{\text{tot}}}{V}$$

$$Q_{\text{tot}} = Q_{12} + Q_{34}$$

12 and 34 in ||

$$Q_i = C_i V_i \quad \text{for each individual capacitor}$$

$$V_{12} C_{12} = Q_{12} = V C_{12}$$

$$V_{34} C_{34} = Q_{34} = V C_{34}$$

$$Q_{12} = Q_1 = Q_2$$

$$Q_{34} = Q_3 = Q_4$$

1 and 2 in series

3 and 4 in series

$$Q_1 = Q_2 = Q_{12} = V C_{12}$$

$$Q_3 = Q_4 = Q_{34} = V C_{34}$$

Know  $V$ ,  
 $C_{12}$ ,  $C_{34}$  from (a)

$$V_1 = \frac{Q_1}{C_1} = \frac{V C_{12}}{C_1}$$

$$V_2 = \frac{Q_2}{C_2} = \frac{V C_{12}}{C_2}$$

$$V_3 = \frac{Q_3}{C_3} = \frac{V C_{34}}{C_3}$$

$$V_4 = \frac{Q_4}{C_4} = \frac{V C_{34}}{C_4}$$

Know  $V$ ,  $C_i$ 's  
 $C_{12}$ ,  $C_{34}$