

## Ejercicios sobre Capacitores

1) Cuál sera la capacidad de un condensador formado por dos placas de  $400 \text{ cm}^2$  de Superficie separadas por una lamina de papel de  $1.5 \text{ mm}$  de espesor cuya constante dieléctrica 3.5?

$$C_0 = \epsilon_0 \frac{A}{d}$$

$$A = 400 \text{ cm}^2$$

$$d = 1.5 \text{ mm}$$

$$\epsilon_0 = 3.5$$

$$C_0 = \frac{3.5 \cdot 400}{1.5} = \frac{1,400}{1.5} = 933.3$$

$$\boxed{C_0 = 933.3}$$

2) Calcula la carga acumulada por un condensador de  $110 \text{ nF}$  al cual se le aplica una diferencia de potencial (ddp) de  $50 \text{ V}$ .

$$C = \frac{Q}{V}$$

$$Q = 110 \text{ nF}$$

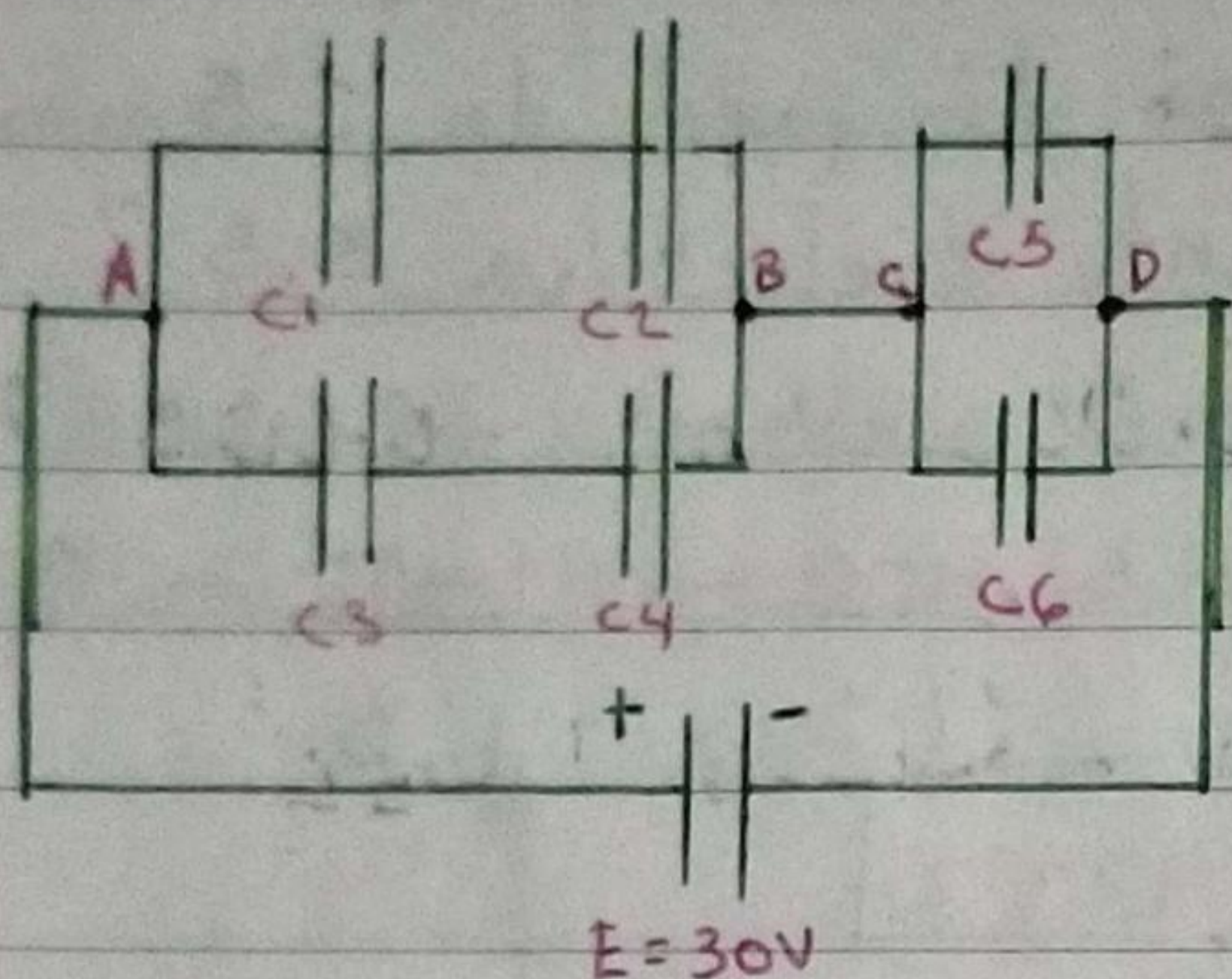
$$V = 50 \text{ V}$$

$$C = \frac{110 \text{ nF}}{50 \text{ V}}$$

$$\boxed{C = 2.2 \text{ nC}}$$



3) Halla la capacidad equivalente y la carga acumulada por cada condensador del siguiente circuito



$$C_1 = 10000 \text{ pF}$$

$$C_2 = 0.010 \text{ }\mu\text{F}$$

$$C_3 = 6 \text{ kpF}$$

$$C_4 = 3 \times 10^{-9} \text{ F}$$

$$C_5 = 3 \text{ nF}$$

$$C_6 = 4 \times 10^{-6} \text{ }\mu\text{F}$$

Convertir a microfaradios ( $\mu\text{F}$ ).

$$C_1 = 10000 \text{ pF} = 0.01 \text{ }\mu\text{F}$$

$$C_2 = 0.010 \text{ }\mu\text{F} = 0.010 \text{ }\mu\text{F}$$

$$C_3 = 6 \text{ kpF} = 0.006 \text{ }\mu\text{F}$$

$$C_4 = 3 \times 10^{-9} \text{ F} = 0.000000003 \text{ }\mu\text{F}$$

$$C_5 = 3 \text{ nF} = 0.003 \text{ }\mu\text{F}$$

$$C_6 = 4 \times 10^{-6} \text{ }\mu\text{F} = 0.000004 \text{ }\mu\text{F}$$

- Suma en Paralelo:

$$C_1 + C_3 = 0.01 + 0.006 = 0.016 \text{ }\mu\text{F}$$

$$C_2 + C_4 = 0.010 + 0.000000003 = 0.0100000003 \text{ }\mu\text{F}$$

- Suma en Serie

$$\frac{1}{C_1 C_3} + \frac{1}{C_2 C_4} = \frac{1}{0.016 \text{ }\mu\text{F}} + \frac{1}{0.0100000003 \text{ }\mu\text{F}} =$$



$$= \left( \frac{0.016}{0.010000003} \right)^{-1} = \frac{0.010000003}{0.016} = 0.625 \mu F$$

$$\boxed{C_{1234} = 0.625 \mu F}$$

- Suma en Paralelo :

$$C_5 + C_6 = 0.003 \mu F + 0.000004 \mu F = 0.003004 \mu F$$

$$C_{56} = 0.003004 \mu F$$

- Suma en Serie de :  $\boxed{C_{1234} + C_{56}}$

$$\left( \frac{1}{C_{1234}} + \frac{1}{C_{56}} \right)^{-1} = \left( \frac{0.003004 \mu F}{0.625 \mu F} \right) =$$

$$\boxed{C_{123456} = 0.0048 \mu F}$$

Carga Acumulada :

$$C = \frac{Q}{V}$$

$$C = \frac{0.0048 \mu F}{30 V} = 0.00016 \mu C$$

$$Q = 0.0048 \mu F$$

$$\boxed{C = 0.00016 \mu C}$$

$$V = 30 V$$



-Carga Acumulada por Cada Condensador:

$$C = \frac{Q}{V}$$

$$Q = C \cdot V$$

$$V = 30V$$

$$C_{1,3} = 0.016 \mu F$$

$$C_{2,4} = 0.0100000003 \mu F$$

$$C_{5,6} = 0.003004 \mu F$$

$$Q_{1,3} = 0.016 \mu F \cdot 30V = 0.48 \mu C$$

$$Q_{2,4} = 0.0100000003 \mu F \cdot 30V = 0.300000009 \mu C$$

$$Q_{5,6} = 0.003004 \mu F \cdot 30V = 0.09012 \mu C$$



5) Calcular la energía almacenada por un condensador de  $20 \mu F$ , si la ddp entre sus armaduras es de  $200 V$ .

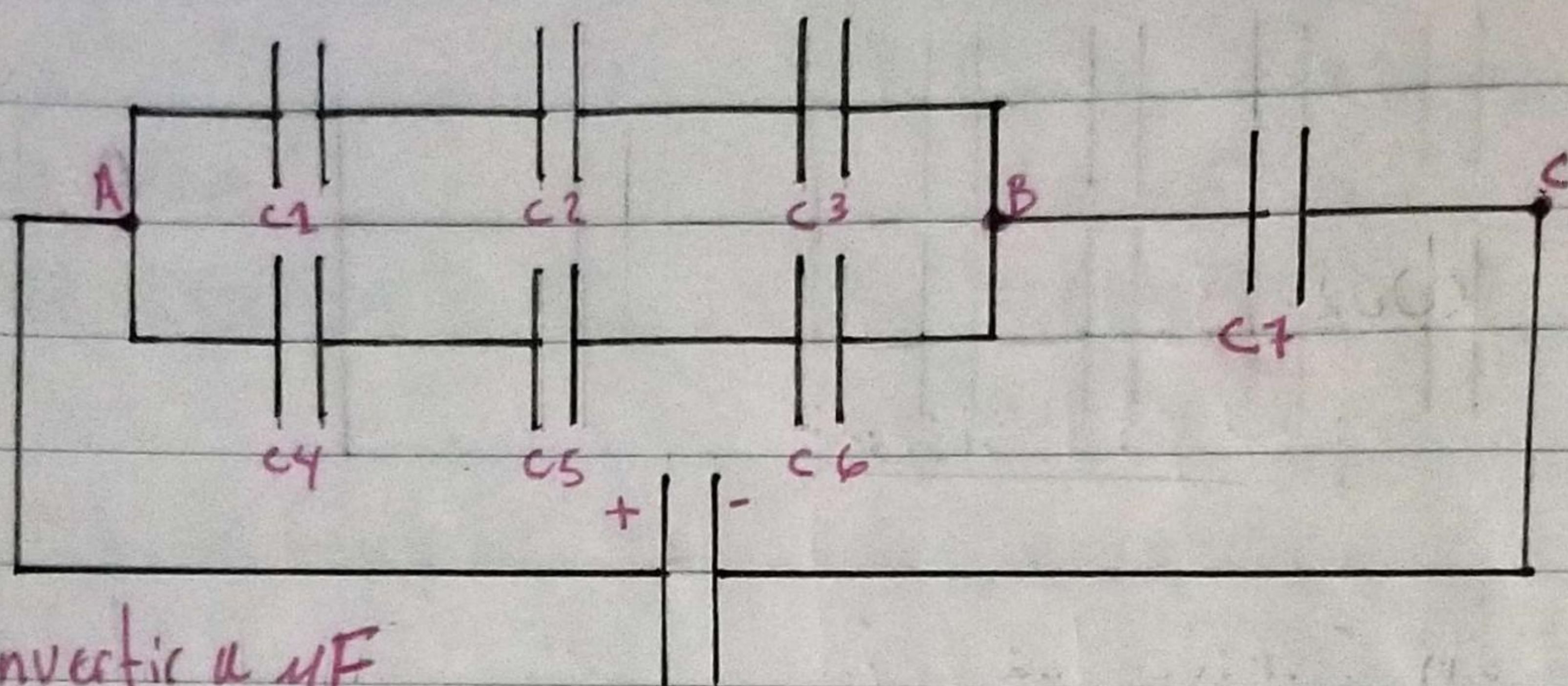
$$Q = 20 \mu F$$

$$V = 200 V$$

$$C = \frac{Q}{V} = \frac{20 \mu F}{200 V} = \boxed{0.1 \mu C}$$



b) Calcular la capacidad equivalente y la carga acumulada por cada condensador del siguiente circuito:



Convertir a  $\mu F$

$$C_1 = 3 \mu F = 3 \mu F \quad E = 100V$$

$$C_2 = 2000 nF = 2 \mu F$$

$$C_3 = 6 \times 10^{-6} F = 0.000006 \mu F$$

$$C_4 = 15 \times 10^6 pF = 15 \mu F$$

$$C_5 = 15 \times 10^6 pF = 15 \mu F$$

$$C_6 = 15 \times 10^6 pF = 15 \mu F$$

$$C_7 = 12 \mu F = 12 \mu F$$

Suma en Paralelo:

$$C_1 + C_4 = 3 \mu F + 15 \mu F = 18 \mu F$$

$$C_2 + C_5 = 2 \mu F + 15 \mu F = 17 \mu F$$

$$C_3 + C_6 = 0.000006 \mu F + 15 \mu F = 15.000006 \mu F$$



Suma en Serie:

$$\frac{1}{C_1 C_4} + \frac{1}{C_2 C_5} + \frac{1}{C_3 C_6} = \left( \frac{1}{18 \mu F} + \frac{1}{17 \mu F} + \frac{1}{15.000006 \mu F} \right)^{-1}$$
$$= \frac{4590.001}{831.00021} = 5.52346 \mu F$$

$$\boxed{C_{123456} = 5.52346 \mu F}$$

Suma en Serie de:  $C_{123456} + C_7$

$$\frac{1}{C_{123456}} + \frac{1}{C_7} = \left( \frac{1}{5.52346 \mu F} + \frac{1}{12 \mu F} \right)^{-1}$$

$$= \left( \frac{5.52346 \mu F}{12 \mu F} \right)^{-1} = \frac{12 \mu F}{5.52346 \mu F} = 2.17255 \mu F$$

$$\boxed{C_{1234567} = 2.17255 \mu F}$$



## Carga por Cada Condensador :

$$C = \frac{Q}{V}$$

$$Q = C \cdot V$$

$$C_{1,4} = 18 \mu F$$

$$C_{2,5} = 17 \mu F$$

$$C_{3,6} = 15.0000006 \mu F$$

$$V = 100$$

$$C_7 = 12 \mu F$$

$$Q_{1,4} = 18 \mu F \cdot 100V$$

$$Q_{1,4} = 1800 \mu C$$

$$Q_{2,5} = 17 \mu F \cdot 100V$$

$$Q_{2,5} = 17 \mu C$$

$$Q_{3,6} = 15.0000006 \mu F \cdot 100V$$

$$Q_{3,6} = 1500.00006 \mu C$$

$$Q_7 = 12 \mu F \cdot 100V$$

$$Q_7 = 1200 \mu C$$