HT No:_6_

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FISICA II 1S2022

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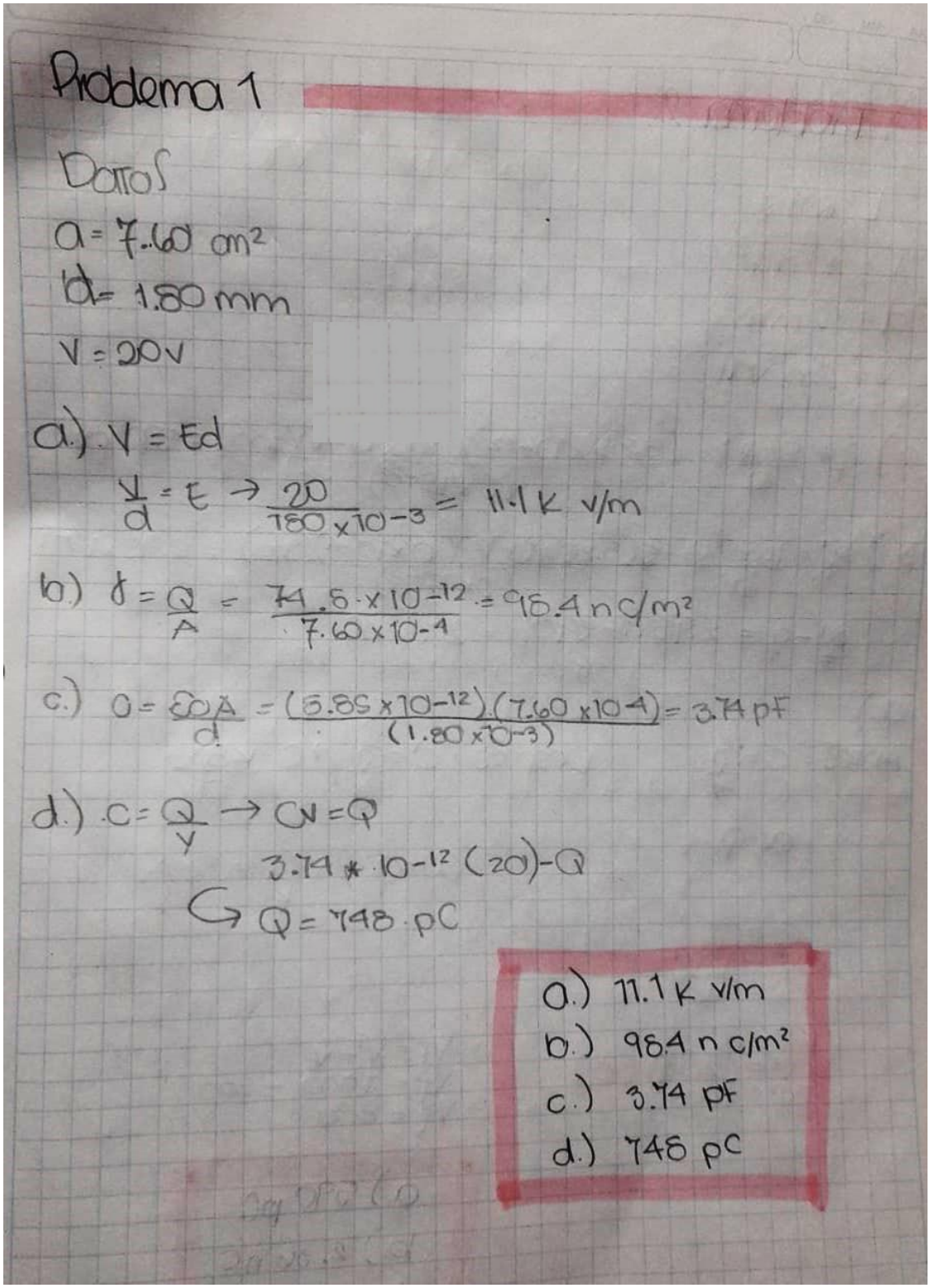
Entrega: LUNES 13/03



Problema 2.

Datos:

$A = 10\ cm^2$

$d = 3\ mm$

$V = 200\ volt$

a.) $q = \frac{\varepsilon_0 A V}{d} = \frac{(8.85 \times 10^{-12})(10 \times 10^{-4})(200)}{(3 \times 10^{-3})} = 590\ pF$

b.) $q' = \frac{K \varepsilon_0 A V}{d} = \frac{5(8.85 \times 10^{-12})(10 \times 10^{-4})(200)}{(3 \times 10^{-3})} = 2.95 \times 10^{-9}$

$q' - q = 2.95n - 590p = 2.36\ nC$

d.)

Antes. $C = \frac{Q}{V}$ Después. $C' = \frac{Q}{V} \rightarrow C = \frac{K \varepsilon_0 A}{d}$

$CV = Q$ $CV = Q$ $\frac{C}{K} = \frac{\varepsilon_0 A}{d}$

$Q = Q$

$CV = \frac{KV'}{K}$

$KV = V'$

$V' = (200)(5)$

$V' = 1000$

$V_T = V' - V$

$V_T = 1000 - 200$

$V_T = 800$

a.) 590 pC

b.) 2.36 nC

d) 800 volt

Problema 3

Datos

$d = 1.50$ cm

$A = 25\ cm^2$

$\Delta V = 250$ V

$K = 80$

$$C = \frac{K\varepsilon_0 A}{d} = \frac{(80)(8.85 \times 10^{-12})(25 \times 10^{-4})}{(0.0150)}$$

$C = 118$ pF

a.) 1.475×10^{-12} (Sin dielectría)

$\rightarrow Q = C\Delta V = (1.475 \times 10^{-12})(250)$

$Q = 369 \times 10^{-12}$ C

b.) (con dieléctrico)

$$C = \frac{Q}{\Delta V} \rightarrow \Delta V = \frac{Q}{C} \rightarrow \frac{369 \times 10^{-12}}{118 \times 10^{-12}} = 3.12 \text{ Volt}$$

c) $U = \frac{1}{2} Q\Delta V = \frac{1}{2}(369 \times 10^{-12})(3.12 - 250)$

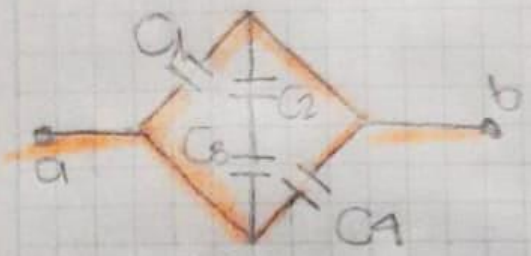
$U = -4.55 \times 10^{-8}$ J ≈ -45.5 Nj

a.) 369 pC

b.) 118pf, 3.12 Volt

c.) -45.5 Nj

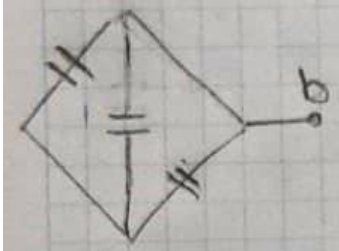
Problema 4.



$C_1 = 4\,\mu F$ $V_{ab} = 100$ Volt
$C_2 = 7\,\mu F$
$C_3 = 5\,\mu F$
$C_4 = 6\,\mu F$

→ En serie C_2 y C_3

$$C_{23} = \left[\frac{1}{C_2} + \frac{1}{C_3}\right]^{-1} \rightarrow \left[\frac{1}{7\times10^{-6}} + \frac{1}{5\times10^{-6}}\right]^{-1} = 2.92\,\mu F$$



→ En paralelo

$C_{eq} = C_1 + C_{23} + C_4$
$C_{eq} = 4\mu + 2.92\mu + 6\mu$
$C_{eq} = 12.92\,\mu F$

$U_{eq} = \frac{1}{2} C\Delta V^2$
$U_{eq} = \frac{1}{2}(12.92\mu)(100)^2$
$U_{eq} = 64.6\,mJ$

*$C_1 // C_{23} // C_4$ → el voltaje es el mismo
$V_1 = V_{23} = V_4 = 100$ Voltios

$C_{23} = \frac{Q}{V} = C_{23}V = Q_{23}$
$(292\times10^{-6})(100) = Q_{23}$
$\rightarrow Q_{23} = 292\,\mu C$

$C_1 = \frac{1}{2} C\Delta V^2 = \frac{1}{2}(4\mu)(100)^2 = 20\,mJ$
$C_2 = \frac{1}{2} C\Delta V^2 = \frac{1}{2}(7\mu)(41.7)^2 = 6.09\,mJ$
$C_3 = \frac{1}{2} C\Delta V^2 = \frac{1}{2}(5\mu)(58.4)^2 = 8.52\,mJ$
$C_4 = \frac{1}{2} C\Delta V^2 = \frac{1}{2}(6\mu)(100)^2 = 30\,mJ$

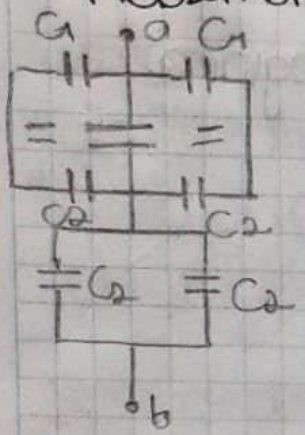
* Como C_2 y C_3 son serie ∴
$Q_{23} = Q_2 = Q_3 = 292\,\mu C$

$C_2 = \frac{Q}{V} \rightarrow V_2 = \frac{Q_2}{C_2}$
$V_2 = 41.71$ Volt

$C_3 = \frac{Q_3}{V}$ $V_3 = \frac{Q_3}{C_3}$
$V_3 = 58.4$ Volt

a.) $C_{eq} = 12.92$ pF
b.) $V_2 = 41.71$ V, $V_3 = 58.4$ V
c.) $U_1 = 20$ mJ, $U_2 = 6.08$ mJ
[x] $U_3 = 8.52$ mJ, $U_4 = 30$ mJ
$U_{eq} = 64.6$ mJ

Problema 5



$C_1 = 5\,MF$
$C_2 = 10\,MF$
$C_3 = 2\,MF$

Paralelo C_2 y C_2
$C_2 = C_2 + C_2 \rightarrow (10M + 10M)$
$C_2 = 20\,MF = V = 13.92\,V$
$Q = 278.4\,C$

En serie C_1 y C_2
$C_{12} = \left(\frac{1}{C_1} + \frac{2}{C_2}\right)^{-1} = \left(\frac{1}{5M} + \frac{1}{10M}\right)$
$C_{12} = 3.33\,MF$

En Paralelo C_{12} y C_{13}
$C_{123} = C_{12} + C_3 + C_{12}$
$C_{123} = 8.66\,MF$

En Serie C_{123} y C_2
$Ceq = \left(\frac{1}{C_{123}} + \frac{1}{C_2}\right)$

$Ceq = \left(\frac{1}{8.66M} + \frac{1}{20M}\right)$

Carga en $C_3 = 83.6\,MC$

$C_3 = Q/V_3$

$V_3 = \frac{Q_3}{C_3} = \frac{(83.6 \times 10^{-6})}{2 \times 10^{-6}}$

$V_2 = 418\,V$

$U = 1/2 \cdot CV^2$

$U = 1/2\,(6.09)(60.)^2$

$U = 10.9\,mJ$

C_{12} y C_3 en paralelo
$V_{12} = V_3 = V_{123} = 418$
$C_{123} = \frac{Q_{123}}{V_{123}}$
$C_{123} = V_{123} = Q_{123}$
$Q_{123} = (8.66 \times 10^{-6})(418)$
$= 362 \times 10^{-6}\,C$

C_{123} y C_2 en serie

$Q_{123} = Q_2 = 362 \times 10^{-6}$
$Ceq = \frac{Qequ}{Veq} \rightarrow Veq = \frac{Qeq}{Ceq} = \frac{3.62}{6.0}$

$V = 59.93\,V \approx 60\,V$

a). $C = 6.09\,MF$
b.) $V = 60\,V$
c.) $U = 10.9\,mJ$