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TAREA ☐
HOJA DE TRABAJO ■
EXAMEN CORTO ☐

No. 6

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HT6

Problema 1.

a) $C_{eq1} = \left(\frac{1}{2\times10^{-6}} + \frac{1}{2\times10^{-6}}\right)^{-1} = 1\times10^{-6}F$

$C_{eq2} = C_5 + C_6 = 2\mu F$

$C_{eq3} = \left(\frac{1}{2\times10^{-6}} + \frac{1}{2\times10^{-6}}\right)^{-1} = 1\times10^{-6}F$

$C_{eq4} = C_{eq3} + C_4 = 2\mu F$

$C_{eq56} = C_2 + C_3 = 2\mu F$

$C_{eq7} = \left(\frac{1}{C_{eq4}} + \frac{1}{C_{eq56}}\right)^{-1} = 1\mu F$

$C_{eq8} = C_{eq6} + C_{eq7} = 3\mu F$

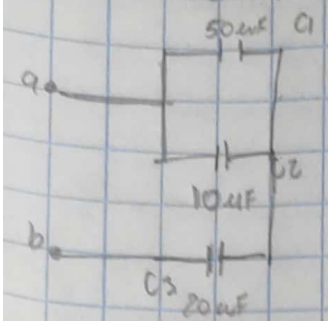
$C_{eqT} = \left(\frac{1}{C_{eq8}} + \frac{1}{C_1}\right)^{-1} = 2\mu F$ $\qquad C_{eq} = 2\mu F$

b) $Q_{eqT} = V_{ab}(C_{eqT}) = 20\mu C$

$Q_{eqT} = 20\mu C \rightarrow V_1 = \frac{Q_1}{C_1} = \frac{20\mu C}{6\mu F} = 3.33V$ $\qquad V = 3.33V$

Problema 2:

$V_{ab} = 50\,V$



$C_{12} = C_1 + C_2 = 60\,\mu F$

$C_{eq} = \left(\frac{1}{C_{12}} + \frac{1}{C_3}\right)^{-1} = \left(\frac{1}{60\mu} + \frac{1}{20\mu}\right)^{-1} = 15\,\mu F$

$U_{sist} = \frac{1}{2} C_{eq} \Delta V^2 = \frac{1}{2}(15\mu)(50)^2 = 19\,mJ$

$U_{sistema} = 19 \times 10^{-3}\,J.$

Problema 3:

$C_1 = 20\,\mu F$
$C_2 = 10\,\mu F$
$C_3 = 30\,\mu F$

$V_0 = 18\,V$

$C_{23} = C_2 + C_3 = 10\,\mu F + 30\,\mu F = 40\,\mu F$

$C_{eq} = \left(\frac{1}{20\mu} + \frac{1}{40\mu}\right)^{-1} = \frac{40}{3}\,\mu F$

$Q_{eq} = \frac{40}{3} \times 10^{-6}(18) = 240\,\mu C$

$Q_{eq} = Q_1 = Q_{23} = 240\,\mu C$

$Q = 240 \times 10^{-6}\,C.$

Problema 4:

$C_1 = 50\,\mu F$
$C_2 = 30\,\mu F$
$C_3 = 36\,\mu F$
$C_4 = 12\,\mu F$

$V_0 = 30\,V.$

$C_{12} = C_1 + C_2 = 80\,\mu F$

$C_{34} = C_3 + C_4 = 48\,\mu F$

$C_{eq} = \left(\frac{1}{80\mu} + \frac{1}{48\mu}\right)^{-1} = 30\,\mu F$

$Q_{eq} = 30\mu(30) = 900\,\mu C.$

$Q_{eq} = Q_{12} = Q_{34}$

$V_{34} = \frac{Q_{34}}{C_{34}} = \frac{900\,\mu C}{48\,\mu F} = 18.75\,V.$

$V_{34} = 18.75\,V.$

$U_3 = \frac{1}{2}(36 \times 10^{-6})(18.75)^2$

$U_3 = 6.33\,mJ$

$U_3 = 6.33 \times 10^{-3}\,J.$

Problema 5:

a) $C = 120\ pF$ $\quad C = \frac{\kappa \varepsilon_0 A}{d} \Rightarrow d = \frac{\kappa \varepsilon_0 A}{C}$

$A = 120\ cm^2$

$\kappa = 6.2$

$\Delta V = 90\ V$ $\quad d = \frac{6.2(8.85\times10^{-12})(120\times10^{-4})}{120\times10^{-6}} = 5.487\times10^{-9}\ m$

$\Delta V = Ed$

$E = \frac{90}{5.487\times10^{-9}} = 1.64\times10^{10}\ V/m$

$E = 1.64\times10^{10}\ V/m$

b) $Q = CV$ $\quad Q_{ind} = Q\left(1 - \frac{1}{\kappa}\right)$

$Q = 120\mu(90) = 0.0108\ C$

$Q_{ind} = 0.0108\left(1 - \frac{1}{6.2}\right) = 9.058\times10^{-3}\ C$

$Q_{ind} = 9.058\times10^{-3}\ C$

Problema 6:

a) $Q_4 = 50\mu C$ $\quad V_4 = \frac{50\mu C}{10\mu F} = 5V$ $\quad C_{23} = \left(\frac{1}{C_3} + \frac{1}{C_2}\right)^{-1} = 5\mu F$

$C_1 = 5\mu F$

$C_2 = C_3 = C_4 = 10\mu F$

$C_{234} = C_{23} + C_4 = 15\mu F$

$V_{234} = 5V$

$Q_{234} = V_{234} C_{234} = 75\mu C$ $\quad Q = 75\times10^{-6}\ C$

$Q_1 = Q_{234} = 75\mu C$

b) $C_{eq} = \left(\frac{1}{C_1} + \frac{1}{C_{234}}\right)^{-1} = \frac{15}{4}\mu F$ $\quad Q_{eq} = 75\mu C$

$V_{eq} = 20\ V$

$V_{eq} = \frac{75\mu C}{\frac{15}{4}\mu F} = 20V$

$U = 3.125\times10^{-5}\ J$

c) $Q_{23} = 5\mu F\,(5V) = 25\mu C$

$U_3 = \frac{(25\times10^{-6})^2}{2(10\times10^{-6})} = 3.125\times10^{-5}\ J$

$Q_{ind} = 4\times10^{-5}\ C$

d) $Q_{ind} = 50\mu\left(1 - \frac{1}{5}\right) = 4\times10^{-5}\ C$