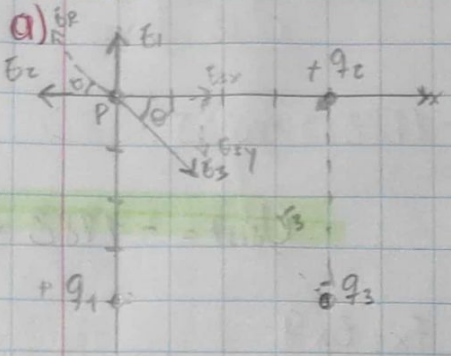
Temario 1c Primer Examen Parcial T3

Problema 1:

a) 

$q_1 = 3.00\,nC \quad (0, -12)\,cm$

$q_2 = 2.00\,nC \quad (12, 0)\,cm$

$q_3 = -4.00\,nC \quad (12, -12)\,cm$

$E = \frac{Kq}{r^2}$

$|E| = E_1 + E_2 + E_3$

$r_3^2 = (0.12)^2 + (0.12)^2 = 0.0288\ m$

$E_1 = \frac{Kq_1}{r_1^2} = \frac{9\times10^9\,(3\times10^{-9})}{(0.12)^2} = 1875\ N/C\ (\hat{j})$

$E_2 = \frac{Kq_2}{r_2^2} = \frac{9\times10^9\,(2\times10^{-9})}{(0.12)^2} = 1250\ N/C\ (-\hat{i})$

$\theta = \tan^{-1}\left(\frac{0.12}{0.12}\right) = 45°$

$E_{3x} = \frac{9\times10^9\,(4\times10^{-9})}{0.0288}\cos 45 = 883$

$E_{3y} = \frac{9\times10^9\,(4\times10^{-9})}{0.0288}\,\text{sen}\,45 = 883.8\ (-\hat{j})$

$|E| = (883.8 - 1250)\,\hat{i} + (1875 - 883.8)\,\hat{j} = -366.2\,\hat{i} + 99$

b) $|E_R| = \sqrt{(-366.2)^2 + (991.2)^2} = 1056.68\ N/C$

$|E_R| = 1057\ N/C$

b) $V = \frac{Kq}{r} \qquad r = \sqrt{0.0288} = 0.17$

$V_R = V_1 + V_2 + V_3$

$V_1 = \frac{K(3n)}{(0.12)} = 225\ V$

$V_2 = \frac{K(2n)}{0.12} = 150\ V$

$V_3 = \frac{K(-4n)}{0.17} = -211.76\ V$

$V_R = 225 + 150 - 211.76$

$V_R = 163.2\ V.$

$V_R = 163\ V$

c) $U_{sist} = U_1 + U_2 + U_3 = K\left(\frac{q_1 q_2}{r_{12}} + \frac{q_1 q_3}{r_{13}} + \frac{q_2 q_3}{r_{23}}\right)$

$U_{sist} = K\left[\frac{(3n)(2n)}{0.17} + \frac{(3n)(-4n)}{0.12} + \frac{(2n)(-4n)}{0.12}\right]$

$U_{sist} = -1.18235 \times 10^{-6}\ J \Rightarrow -1182.3 \times 10^{-9}\ J$

d) $Q = +5nC$

$U_{sist} = -1182 \times 10^{-9}\ J$

$F = Eq \Rightarrow F_x = E_x q$

$F_y = E_y q$

$F_y = (991.2)(5n) = 4.956 \times 10^{-6}\ N$

$F_x = (-366.2)(5n) = -1.831 \times 10^{-6}\ N$

$\theta = \tan^{-1}\left(\frac{4.956\,u}{-1.831\,u}\right) = -69.72 \Rightarrow \alpha = 180 - \theta$

$\alpha = 180 - 69.72$

$\alpha = 110.2°$

$\alpha = 110°$

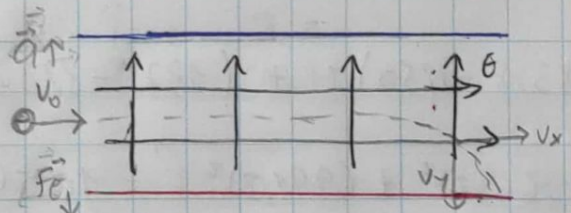
Problema 2.

$m = 10\,mg$

$q = -4.00\,\mu C$

$V_{ox} = 20\ m/s$

$E = 50\ N/C\ (\vec{j})$



a) $\vec{a} = \frac{\vec{E}q}{m} = \frac{(50)(-4\mu)}{10 \times 10^{-6}} = -20\ m/s^2$ **$|a| = 20\ m/s^2$**

b) $t = 1.5\,s$

$V_{oy} = 0$ $\quad V_{fy} = V_{oy}^{\,0} + at$

$V_{ox} = V_x$ $\quad V_{fy} = (-20)(1.5) = -30\ m/s$

$V = \sqrt{(20)^2 + (-30)^2} = 36.05\ m/s$

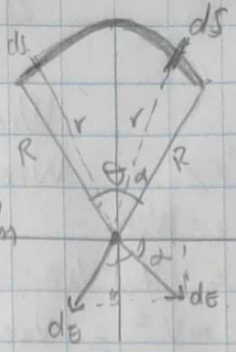
$V = 36.1\ m/s$

Problema 3:

$q = 0.471\ nC$

$\theta = 60°$

$R = 18.0\ cm$



$s = \ell$

$r = R \qquad s = R\alpha$

$dE = \frac{k\,dq}{r^2}$

$\lambda = \frac{q}{\ell} = \frac{0.471_n}{0.18(\frac{\pi}{3})} = 2.5\,nC/m$

$dq = \lambda\, ds$

$dq = \lambda R\, d\alpha$

Por simetría $\Sigma x = 0$

$$E_y = \int k\,\frac{\lambda R\, d\alpha}{r^2}\sin\alpha = \frac{2k\lambda}{r}\int_{\pi/3}^{\pi/2}\sin\alpha\, d\alpha$$

$$E_y = \frac{2k\lambda}{r}\left[-\cos\alpha\Big|_{\pi/3}^{\pi/2}\right] = \frac{2k\lambda}{r}\left(0 + \frac{1}{2}\right) =$$

$$E_y = \frac{2k(2.5n)}{0.18}\left(\frac{1}{2}\right) = 125\ N/C\,(-\hat{j})$$

$E = 125\ N/C$

Problema 4:

$\lambda = 9.00\ nC/m$

$R = 0.08\ m$

$A = 2R$

$$\Phi = \frac{q_{enc}}{\varepsilon_0} \Rightarrow q_{enc} = \lambda A$$

$q_{enc} = (9n)(2(0.08))$

$$\Phi = \frac{(9n)(2)(0.08)}{\varepsilon_0} = 162.71\ Nm^2/C$$

$\Phi = 163\ Nm^2/C$

Problema 5.

$P = 4.50\ nCm$

$E = 5.00 * 10^7\ N/C$

$\theta = 0$

a) $U = -pE\cos\theta = -(4.5n)(5*10^7)\cos 0° = -225\ J$

$U = -225\ J$

b) $W_{FE} = -\Delta U$

$W_{FE} = -(U_0 - U_f)$ $\qquad W_{FE} = -(-225 - 0)$

$W_{FE} = 225.$

$U_0 = -225$

$U_f = -pE\cos 90° = 0.$

$W = 225\ J$

Problema 6:

$p^+ = 1.6022 \times 10^{-19}\ C$

$V_{0A} = 50\ km/s$

$V_B = 80\ km/s$

$m_p = 1.6726 \times 10^{-27}\ kg$

$\Delta V_{A-B} = V_A - V_B$

$W_{FE} = q_0 V_{AB}$

$W_{FE} = \Delta K$

$W_{FE} = W_{FE}$

$K_f - K_0 = q_0 V_{AB}$

$\frac{1}{2} m V_f^2 - \frac{1}{2} m V_0^2 = V_{AB}$

q

$$V_{AB} = \frac{\frac{1}{2} m (V_f^2 - V_0^2)}{q} = \frac{\frac{1}{2}(1.6726 \times 10^{-27})[(80 \times 10^3)^2 - (50 \times 10^3)^2]}{1.6022 \times 10^{-19}}$$

$V_{AB} = 20.356\ V$

$V_{AB} = 20.4\ V$

Problema 7:

$Q = 5.00\ nC$

$R = 0.1\ m$

$\rho = q_{enc}/V$

$\int E_A = \frac{q_{enc}}{\varepsilon_0}$

$r = 0.05\ m$

$E(4\pi r^2) = \frac{q_{enc}}{\varepsilon_0}$

$E(4\pi r^2) = \frac{Q r^3}{\varepsilon R^3}$

$\rho_{TOTAL} = \rho_{enc}$

$\frac{Q}{V_T} = \frac{q_{enc}}{V_{enc}}$

$E = \frac{Q r}{4\pi R^3 \varepsilon_0} = \frac{(5n)(0.05)}{4\pi (0.1)^3 \varepsilon_0}$

$\frac{Q V_{enc}}{V_T} = q_{enc}$

$E = 2247.9\ N/C. = 2.25\ kN/C.$

$\frac{Q \cancel{4/3\pi} r^3}{\cancel{4/3\pi} R^3} = q_{enc}$

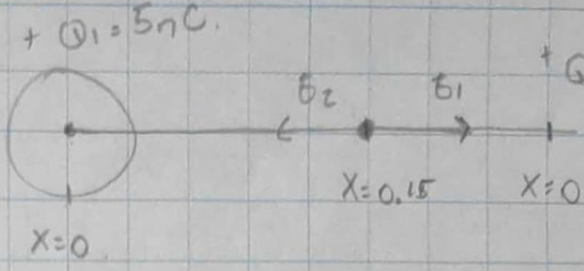
$E = 2.25\ kN/C$

$q_{enc} = \frac{Q r^3}{R^3}$

b) $Q_2 = 2.00\,nC$

$X = 20.0\,cm$

E en $x = 0.15\,m$



$$E = \frac{kQ}{R}$$

$$E_1 = \frac{k(5n)}{0.15} = 2000\ N/C\ (\hat{i})$$

$$E_2 = \frac{k(2n)}{(0.05)^2} = 7200\ N/C\ (-\hat{i})$$

$$E_R = 2000 - 7200 = -5200\ N/C\ (-\hat{i})$$

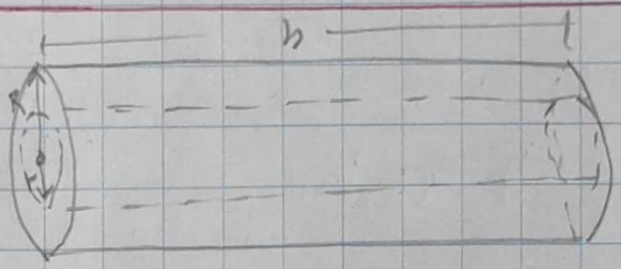
$|E_R| = 5.2\ kN/C$

Problema 8:

$R = 0.15\,m$

$\rho = 2.50\,\mu C$

$r = 0.05\,m$



$$q_{enc} = \rho V$$

$$\oint E\,dA = \frac{q_{enc}}{\varepsilon_0}$$

$$E(2\pi r h) = \frac{\rho \pi r^2 h}{\varepsilon_0}$$

$$E = \frac{\rho r}{2\varepsilon_0} = \frac{(2.5\,\mu)(0.05)}{2\varepsilon_0} =$$

$$E = 7062.1\ N/C$$

$E = 7.1\ kN/C$