Universidad de San Carlos de Guatemala
Facultad de Ingeniería, Departamento de Física
Primer Exámen Física 2, Segundo Semestre 2022

Registro Académico: 2017 09088	CUI: 3636 19232 0115
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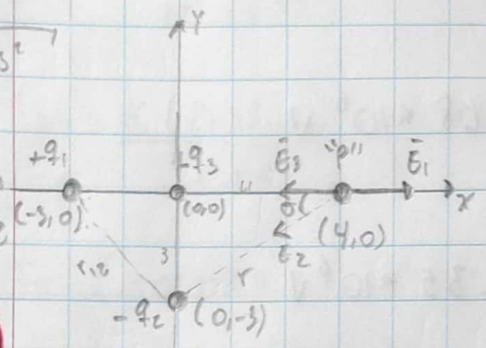
Catedrático: Ing. Edgar Alvarez Coti	Sección: R

Pregunta 1:

$q_1 = 4.00\,\mu C \quad (-3, 0)\ cm.$
$q_2 = -6.00\,\mu C \quad (0, -3)\ cm.$
$q_3 = -6.00\,\mu C \quad (0, 0)\ cm.$

$r_{12} = \sqrt{3^2 + 3^2}$
$r_{12} = \sqrt{18} =$
$r_{12} = 3\sqrt{2}\ cm$
$r_{12} = 0.042$



$\bar{E}_R = \bar{E}_1 + \bar{E}_2 + \bar{E}_3$

a)

$|E_1| = \frac{K q_1}{r_1^2} = \frac{K(4\mu)}{(0.07)^2} = 7.35 * 10^6\ N/C \quad (+\hat{i})$

$|E_3| = \frac{K q_3}{r_3^2} = \frac{K(6\mu)}{(0.04)^2} = 33.8 * 10^6\ N/C \quad (-\hat{i})$

$r = \sqrt{3^2 + 4^2} = 5\ cm.$

$|E_2| = \frac{K q_2}{r_2^2} (\cos\theta\, \hat{i} + \operatorname{Sen}\theta\, \hat{j})$

$\theta = \operatorname{Tan}^{-1}\left(\frac{4}{3}\right) = 53.13°$

$|E_2|_x = \frac{K(6\mu)}{(0.05)^2} \cos 53.13° = 12.96 * 10^6\ N/C \quad (-\hat{i})$

$|E_2|_y = \frac{K(6\mu)}{(0.05)^2} \operatorname{Sen} 53.13° = 17.27 * 10^6\ N/C \quad (-\hat{j})$

$|E_R| = (7.35 - 33.8 - 12.96) * 10^6\,\hat{i} + (-17.26 * 10^6)\,\hat{j}$

$|E_R| = -39.41 * 10^6\,\hat{i} - 17.26 * 10^6\,\hat{j}$

$|E_R| = \sqrt{(-39.41 * 10^6)^2 + (-17.26 * 10^6)^2} = 43.02 * 10^6\ N/C.$

$|E_R| = 43.02 * 10^6\ N/C$

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b) $V_1 = \frac{Kq_1}{r} = \frac{K(4\mu)}{(0.07)} = 0.514 * 10^6\ V$

$V_2 = \frac{Kq_2}{r} = \frac{K(-6\mu)}{(0.05)} = -1.08 * 10^6\ V$

$V_3 = \frac{Kq_3}{r} = \frac{K(-6\mu)}{(0.04)} = -1.35 * 10^6\ V$

$V_T = (0.514 - 1.08 - 1.35) * 10^6\ V = -1.92 * 10^6\ V$.

$V = -1.92 * 10^6\ V$ +1

c) $U_1 = \frac{Kq_1q_2}{r_{12}} = \frac{K(4\mu)(-6\mu)}{0.042} = -5.14\ J$

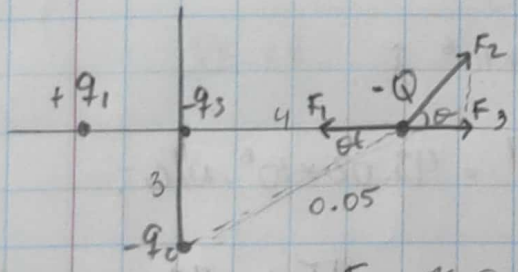
$U_2 = \frac{Kq_1q_3}{r_{13}} = \frac{K(4\mu)(-6\mu)}{0.03} = -7.20\ J$.

$U_3 = \frac{Kq_2q_3}{r_{23}} = \frac{K(-6\mu)(-6\mu)}{0.03} = 10.8\ J$

$U_T = (-5.14 - 7.20 + 10.8)\ J = -1.54\ J$.

$U_T = -1.54\ J$ +1

d) $Q = -8nC$ (4,0)



$F_1 = \frac{K(8n)(4\mu)}{(0.07)^2} = 0.059\ N\ (-\hat{i})$

$F_3 = \frac{K(8n)(6\mu)}{(0.04)^2} = 0.27\ N\ (+\hat{j})$

$\theta = 53.13°$

$F_2 = \frac{KQq_2}{(0.05)^2}(\cos\theta\, i + \text{sen}\,\theta\, j)$

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$$F_{2x} = \frac{k(8n)(6\mu)}{(0.05)^2}\cos 53.13^\circ = 0.10\ N\ (\hat{i})$$

$$F_{2y} = \frac{k(8n)(6\mu)}{(0.05)^2}\operatorname{sen} 53.13^\circ = 0.14\ N\ (\hat{j})$$

$$F_R = (-0.059 + 0.27 + 0.10)N(\hat{i}) + (0.14\ N)\hat{j}$$

$$F_R = 0.311\ \hat{i} + 0.14\hat{j} \Rightarrow \theta = \operatorname{Tan}^{-1}\left(\frac{0.14}{0.311}\right) = 24.23^\circ$$

$$\theta = 24.2^\circ$$

Pregunta 2:

$V_0 = 0$ $\quad m_{e^-} = 9.1094 \times 10^{-31}\ kg$ $\quad q_{e^-} = -1.6022 \times 10^{-19}\ C$

a) $V_f = 3 \times 10^7\ m/s$

$x = 0.02\ m$

$V_f^2 = \cancel{V_0^2}^{\,0} + 2a\Delta x$ $\quad a = \frac{(3\times10^7\ m/s)^2}{2(0.02)}$

$V_f^2 = 2a\Delta x$

$F = ma$ $\quad \frac{V_f^2}{2\Delta x} = a$ $\quad a = 2.25 \times 10^{16}\ m/s^2$

$F = Eq$

$F = F$

$ma = Eq$ $\quad E = \frac{(9.1094\times10^{-31})(2.25\times10^{16})}{(1.6022\times10^{-19})} = 127.93 \times 10^3\ N/C$

$E = \frac{ma}{q_{e^-}}$

$E = 127.93 \times 10^3\ N/C$

b) $V_f = \cancel{V_0}^{\,0} + at$

$t = \frac{3\times10^7\ m/s}{2.25\times10^{16}\ m/s^2} = 1.33 \times 10^{-9}\ s$

$\frac{V_f}{a} = t$

$t = 1.33\ ns$

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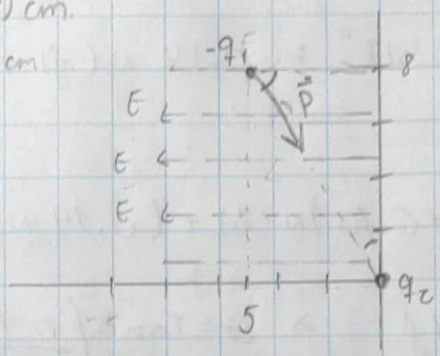
Pregunta 3:

$\bar{P} = 3.60\ \omega\ Cm$ $E = 2.00 * 10^7 \frac{N}{C}(-\hat{i})$

$-q_1$ (-5, 8) cm.

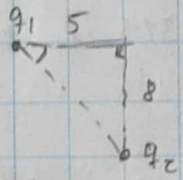
$+q_2$ (0, 0) cm

a)



$\tau = \bar{P} E \operatorname{Sen}\theta$.

$\theta = \operatorname{Tan}^{-1}\left(\frac{8}{5}\right)$



$\theta = 57.99 = 60°$

$\tau = (3.60\omega)(2 * 10^7) \operatorname{Sen} 60°$

$\tau = 62.35\ Nm.$

$\tau = 62.35 Nm$ ✓4

b $\Delta W = -\Delta U$

$U_f = PE\cos\theta_f$ $U_0 = PE\cos 60° = (3.60\omega)(2 * 10^7)\cos 60°$

$U_0 = PE\cos\theta_0$ $U_0 = 36\ J.$

$U_f = PE\cos 0°$

$U_f = (3.60\omega)(2 * 10^7)\cos 0° = 72\ J.$

$\Delta W = -[U_f - U_0] = -[72 - 36] = -36\ J$

$\Delta W = -36\ J$ ✓4

Pregunta 4.

b) $+q_1 = 3.75\,\mu C$ $(0,0)\,m$
$-q_2 = -5.25\,\mu C$ $(0.6,0)\,m$

$V_T = V_1 + V_2$.

$V_T = 0$

$V_1 = -V_2$

$\frac{Kq_1}{r_1} = -\left(\frac{Kq_2}{r_2}\right)$

$V_2 = \frac{K(-5.25\times10^{-6})}{0.6} = -78750$

$V_1 = -V_2$.

$\frac{Kq_1}{-V_2} = r_1$

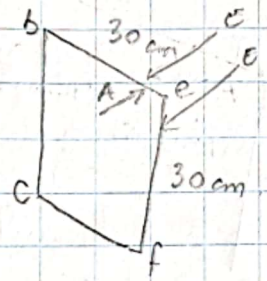
$r_1 = \frac{K(3.75\mu)}{78750} = 0.43\,m$.

(0.43, 0)

$x = 0.43\,m$.

Pregunta 5.

a)



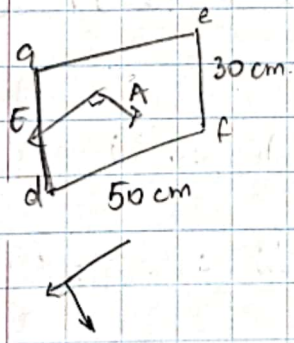
$E = 2.5\times10^3\ N/C\ (+z)$

$\Phi = EA\cos\theta$.

$\Phi = (2.5\times10^5)(0.3)^2\cos 180° =$

$\Phi = -225\ \frac{N}{C}m^2$ $\quad \Phi = -225\ \frac{N}{C}m^2$

b)



$\Phi = (2.5\times10^3)(0.3\cdot0.5)^2\cos\vec{90}° = 0$.

$\Phi = 0$.