Edgar Ospina III Parte

26)

$m = 3g = 3 \cdot 10^{-3} \, kg$

$q = \, ?$

$r = 50 mm = 0,05 m$

80mm   80mm

$F_e \leftarrow$ 25mm | 25mm $\rightarrow FE$

q_1 50mm q_2

m   m

$T \sin \theta$

$+ \cos \theta$ q, m $\rightarrow F_e$

$\cos \theta = 25mm / 80mm$

$\theta = \cos^{-1} \cdot (0,3125)$

$\theta = 72°$

$W = m \cdot g$
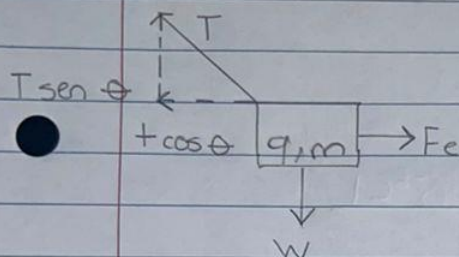
$W = 3 \cdot 10^{-3} kg \cdot 9,8 m/s^2$

$W = 0,0294 N$

$\Sigma F_x = 0$

$F_e - T \cos \theta = 0$

$F_e = T \cos \theta$

$\Sigma F_y = 0$

$T \sin \theta - W = 0$

$T = \dfrac{W}{\sin \theta}$

$F_e = 0,03091 N \cdot \cos 72°$

$F_e = 9,552 \cdot 10^{-3} N$

$T = \dfrac{0,0294 N}{\sin 72°}$

$T = 0,03091 N$

$F_e = k \cdot \dfrac{|q_1| \cdot |q_2|}{r^2}$

$q_1 = q_2 = q$

$q \cdot q = q^2$

$\dfrac{F_e \cdot r^2}{k} = q^2$

$\dfrac{9,552 \cdot 10^{-3} N \cdot (0,05m)^2}{9 \cdot 10^9 N \cdot m^2 / C^2} = q^2$
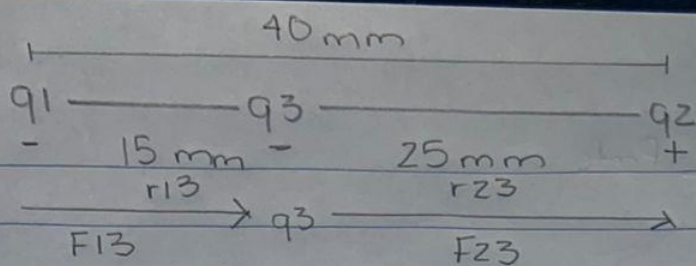
$q^2 = 2,653 \cdot 10^{-15} C^2$

$\sqrt{q^2} = \sqrt{2,653 \cdot 10^{-15} C^2}$

$q = \pm 5,151 \cdot 10^{-8} C$

$q = \pm 51,51 \, nC$

27)

$$40\,mm$$

q1 ———————— q3 ———————————— q2

$-$ 15 mm $-$ 25 mm $+$

      r13   r23

         $\rightarrow$ q3 ——————— $\rightarrow$

   F13   F23

$q_1 = -40\mu C = -40 \cdot 10^{-6} C$

$q_2 = 60\mu C = 60 \cdot 10^{-6} C$

$q_3 = -12\mu C = -12 \cdot 10^{-6} C$

$r_{13} = 15\,mm = 0,015\,m$

$r_{23} = 25\,mm = 0,025\,m$

$$F_{13} = K \cdot \frac{|q_1| \cdot |q_3|}{r_{13}^2}$$

$$F_{13} = 9 \cdot 10^9 \, N\,m^2/C^2 \cdot \frac{|-40 \cdot 10^{-6} C| \cdot |-12 \cdot 10^{-6} C|}{(0,015\,m)^2}$$

$$F_{13} = 9 \cdot 10^9 \, N\,m^2/C^2 \cdot 2,133 \cdot 10^{-6} \, C^2/m^2$$

$$F_{13} = 19\,200\,N$$

$$F_{23} = K \cdot \frac{|q_2| \cdot |q_3|}{r_{23}^2}$$

$$F_{23} = 9 \cdot 10^9 \, N\,m^2/C^2 \cdot \frac{|60 \cdot 10^{-6} C| \cdot |-12 \cdot 10^{-6} C|}{(0,025\,m)^2}$$

$$F_{23} = 9 \cdot 10^9 \, N\,m^2/C^2 \cdot 1,152 \cdot 10^{-6} \, C^2/m^2$$

$$F_{23} = 10\,368\,N$$

$$F = F_{13} + F_{23}$$

$$F = 19\,200\,N + 10\,368\,N$$

$$F = 29\,568\,N, \text{ hacia la derecha}$$

28) +q1 —————6mm————— q2
+

$r_{23} = \sqrt{(6mm)^2 + (8mm)^2}$

$r_{23} = \sqrt{100\,mm^2}$

$r_{23} = 10\,mm$

8 mm | r23

+q3
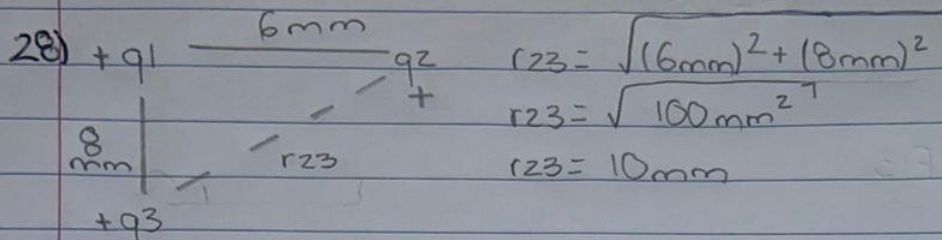
$q_1 = 2\,\mu C = 2 \cdot 10^{-6}\,C$

$q_2 = 3\,\mu C = 3 \cdot 10^{-6}\,C$

$q_3 = 4\,\mu C = 4 \cdot 10^{-6}\,C$

$r_{13} = 8mm = 0,008\,m$

$r_{23} = 10mm = 0,01\,m$

$F_{13} = K \cdot \dfrac{|q_1| \cdot |q_3|}{r_{13}^2}$

$F_{13} = 9 \cdot 10^9 \cdot \dfrac{|2 \cdot 10^{-6}C| \cdot |4 \cdot 10^{-6}C|}{(0,008m)^2}$
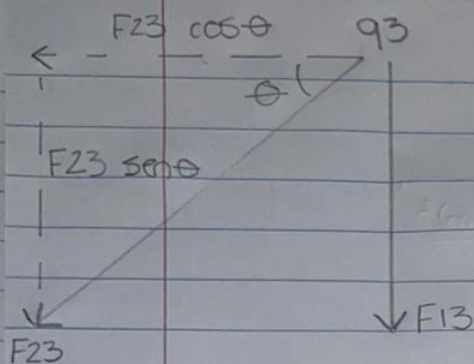
$F_{13} = 9 \cdot 10^9 \cdot 1,25 \cdot 10^{-7}\,C^2/m^2$

$F_{13} = 1\,125\,N$

$F_{23} = K \cdot \dfrac{|q_2| \cdot |q_3|}{r_{23}^2}$

$F_{23} = 9 \cdot 10^9\,N\,m^2/C^2 \cdot \dfrac{|3 \cdot 10^{-6}C| \cdot |4 \cdot 10^{-6}C|}{(0,01m)^2}$

$F_{23} = 9 \cdot 10^9\,N\,m^2/C^2 \cdot 1,2 \cdot 10^{-7}\,C^2/m^2$

$F_{23} = 1\,080\,N$

$$\tan\theta = 8mm / 6mm$$
$$\theta = \tan^{-1}(1,333)$$
$$\theta = 53,13°$$

$$\sum F_x = -F23 \cos\theta$$
$$\sum F_x = -(1\,080N \cdot \cos 53,13°)$$
$$\sum F_x = -648\,N$$

$$\sum F_y = -F13 - F23 \, sen\,\theta$$
$$\sum F_y = -(1\,125N) - (1\,080N \cdot sen\, 53,13°)$$
$$\sum F_y = -1125N - 864N$$
$$\sum F_y = -1989\,N$$

$$F = \sqrt{(\sum F_x)^2 + (\sum F_y)^2}$$
$$F = \sqrt{(-648N)^2 + (-1989N)^2}$$
$$F = 2\,092N$$

$$\vec{F} = 2\,092N,\ 288,05°$$

$$\tan\phi = |F_y| / |F_x|$$
$$\tan\phi = |-1989N| / |-648\,N|$$
$$\phi = \tan^{-1} 3,069$$
$$\phi = 71,95° \ (QA)$$

$$\theta = 360° - \phi$$
$$\theta = 360° - 71,95°$$
$$\theta = 288,05°$$