

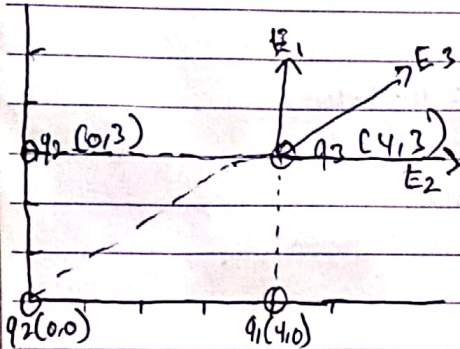
$$1) q_1 = +2 \text{ stat C} \rightarrow (4,0) \text{ cm}$$

$$q_2 = +5 \text{ stat C} \rightarrow (0,3) \text{ cm}$$

$$q_3 = +10 \text{ stat C} \rightarrow (4,3) \text{ cm}$$

$$q_4 = -1 \text{ stat C} \rightarrow (0,0) \text{ cm}$$

$$k = 1 \text{ dyne} \cdot \text{cm}^2 / \text{stat} \cdot \text{C}^2$$



a) gaya listrik pada  $q_4 (0,0)$

$$F = q_4 \cdot k \left[ \frac{q_1}{r_{01}^2} \cdot \hat{r}_{01} + \frac{q_2}{r_{02}^2} \cdot \hat{r}_{02} + \frac{q_3}{r_{03}^2} \cdot \hat{r}_{03} \right]$$

$$= -1 \cdot \left[ \frac{2}{16} (-i) + \frac{5}{9} (-j) + \frac{10}{25} (-4i - 3j) \right]$$

$$= 1 \left[ \frac{2}{16} (i) + \frac{5}{9} (j) + \frac{40}{125} (i) + \frac{30}{125} (j) \right]$$

$$= \left[ \left( \frac{2}{16} + \frac{40}{125} \right) i + \left( \frac{5}{9} + \frac{30}{125} \right) j \right]$$

$$= [0,445 i + (0,796) j]$$

$$F = \tan \text{ arc } 0,796$$

$$0,445$$

B) medan listrik  $q_1, q_2, q_3$

$$E_1 = k \frac{q_1}{r_1^2} = 1 \cdot \frac{2}{4^2} (i) = \frac{2}{16} (i)$$

$$E_2 = k \frac{q_2}{r_2^2} = 1 \cdot \frac{5}{3^2} (j) = \frac{5}{9} (j)$$

$$E = \frac{2}{16} i + \frac{5}{9} j + \frac{40}{125} i + \frac{30}{125} j$$

$$E = \left( \frac{2}{16} + \frac{40}{125} \right) i + \left( \frac{5}{9} + \frac{30}{125} \right) j$$

C) potensial listrik pd titik  $(0,0)$

$$V = k \left( \frac{q_1}{r_1} + \frac{q_2}{r_2} + \frac{q_3}{r_3} \right)$$

$$= 1 \left( \frac{2}{4} + \frac{5}{3} + \frac{10}{5} \right)$$

$$= 1 \left( \frac{20 + 100 + 120}{60} \right)$$

$$= 1 \left( \frac{250}{60} \right)$$

$$= 4,167 \text{ dyne} \cdot \text{cm} / \text{nc}$$

D)  $W = w_1 + w_2 + w_3 + w_4$

$$w_1 = 0$$

$$w_2 = V_2 \cdot q_2 = \frac{k \cdot q_1 \cdot q_2}{r_{12}} = 1 \cdot \frac{2 \cdot 5}{3} = 5 \text{ dyne} \cdot \text{cm}$$

$$w_3 = V_3 \cdot q_3 = \left[ \frac{k q_1}{r_{13}} + \frac{k q_2}{r_{23}} \right] q_3$$

$$= \left[ \frac{1 \cdot 2}{3} + \frac{1 \cdot 5}{4} \right] \cdot 10$$

$$= 19,16 \text{ dyne} \cdot \text{cm}$$

$$w_4 = V_4 \cdot q_4 = \left[ k \frac{q_1}{r_{14}} + k \frac{q_2}{r_{24}} + \frac{k q_3}{r_{34}} \right] q_4$$

$$= \left( 1 \cdot \frac{2}{4} + 1 \cdot \frac{5}{3} + 1 \cdot \frac{10}{5} \right) \cdot (-1)$$

$$= \left( \frac{50}{12} \right) \cdot (-1)$$

$$= -4,16 \text{ dyne} \cdot \text{cm}$$

$$w = 0 + 5 + 19,16 + 4,16$$

$$= 28,32 \text{ dyne} \cdot \text{cm}$$

$$2) dE = \frac{1}{4\pi\epsilon_0} \cdot \frac{2(\lambda dx) \cos \theta}{r^3} \hat{k}$$

$$E = \frac{1}{4\pi\epsilon_0} \int_0^{y/2} \frac{2\lambda z}{(z^2 + x^2)^{3/2}} dx$$

$$= \frac{2\lambda z}{4\pi\epsilon_0} \left[ \frac{x}{z^2 \sqrt{z^2 + x^2}} \right]_0^{y/2}$$

$$= \frac{2\lambda \cdot z \cdot y/2}{4\pi\epsilon_0 \cdot z^2 \sqrt{z^2 + (y/2)^2}} = \frac{\lambda y}{4\pi\epsilon_0 \cdot z \sqrt{z^2 + (y/2)^2}}$$

Jadi:  $(z \gg \frac{1}{2}a)$  maka medan listrik pada kawat yang panjangnya  $a$  adalah

$$E = \frac{1}{4\pi\epsilon_0} \cdot \frac{\lambda a}{z^2}$$

