No. Senin

Date 18 Maret 2024

Kelistrikan dan Kemagnetan.

Medan listrik ($\vec{E}$)

(1.) $\vec{E} = \frac{1}{4\pi\varepsilon_0} \frac{q}{r^2} \hat{r}_0$

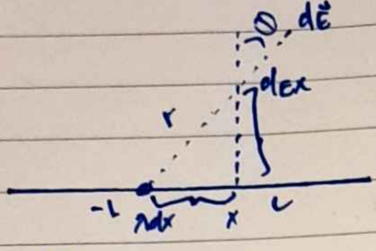
$= k \frac{q}{r^2} \hat{r}_0 \rightarrow$ oleh muatan diskrit.

(2.) $\vec{E} = \frac{1}{4\pi\varepsilon_0} \int \frac{\lambda\, dl}{r^2} \hat{r}_0 \rightarrow q_\lambda = \lambda l \rightarrow$ muatan kedistribusi pada penggaris

(3) $\vec{E}\ \frac{1}{4\pi\varepsilon_0} \iint \frac{\sigma\, da}{r^2} \hat{r}_0$ luas permukaan.

(4) $\vec{E}\ \frac{1}{4\pi\varepsilon_0} \iiint \frac{\rho\, dv}{r^2} \hat{r}_0$

Keterangan hal 50. (1) $\frac{k}{r^2} = \frac{1}{4\pi\varepsilon_0 r^2}$



$$d\vec{E} = dE_Y + dE_x$$

$$d\vec{E} = dE_Y$$

$$dE_Y = dE \cos\theta$$

$$E = \frac{1}{4\pi\varepsilon_0}\int_{-L}^{L}\frac{\lambda\,\overset{dx}{dL}}{r^2}\cos\theta$$

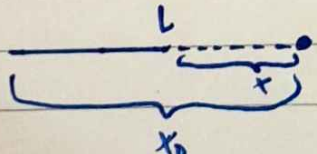
$$= \frac{2}{4\pi\varepsilon_0}\int_{0}^{L}\frac{\lambda dx}{(x^2+z^2)}\cos\theta$$

$$E = \frac{2\lambda z}{4\pi\varepsilon_0}\int_{0}^{L}\frac{dx}{(x^2+z^2)^{3/2}}$$

$$E = \frac{2\lambda z}{4\pi\varepsilon_0}\left(\frac{x}{z^2\sqrt{x^2+z^2}}\right)\Bigg|_0^L$$

$$= \frac{2\lambda z}{4\pi\varepsilon_0}\left[\frac{L}{z^2\sqrt{L^2+z^2}} - \frac{0}{z^2\sqrt{0+z^2}}\right]$$

$$= \frac{2\lambda z}{4\pi\varepsilon_0}\left[\frac{L}{z^2\sqrt{L^2+z^2}}\right]$$



$$\vec{E} = \frac{1}{4\pi\varepsilon_0}\int_{0}^{L}\frac{x\,dx}{(x_0-x)^2} \rightarrow \vec{E} = \frac{1}{4\pi\varepsilon_0}\lambda\int_{0}^{L}(x_0-x)^{-2}\,dx$$

$$= \frac{1}{4\pi\varepsilon_0}\lambda\left((x_0-x)^{-1}\right|_0^L$$

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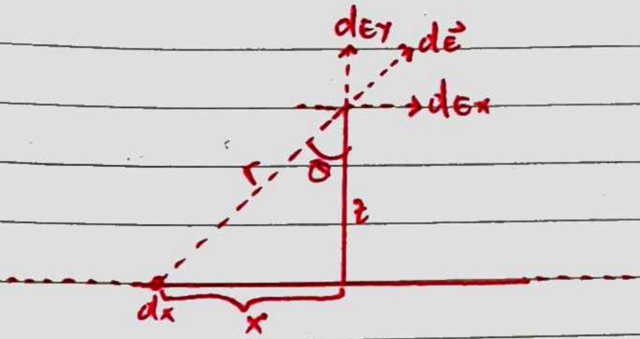
$$= \frac{1}{4\pi\varepsilon_0} \lambda \left(\frac{1}{(x_0 - x)} \right) \Big|_0^L$$

$$= \frac{1}{4\pi\varepsilon_0} \lambda \left(\frac{1}{(x_0 - L)} - \frac{1}{(x_0 - 0)} \right) = \frac{1}{4\pi\varepsilon_0} \left(\frac{L}{x_0(x_0 - L)} \right)$$



$$\vec{E} = \vec{E}_x + \vec{E}_y$$

$$E = \frac{1}{4\pi\varepsilon_0} \int_{-\infty}^{\infty} \frac{x\,dx}{r^2} \cdot \cos\theta$$

$$\cos\theta = \frac{z}{r} \Rightarrow r = \frac{z}{\cos\theta}$$

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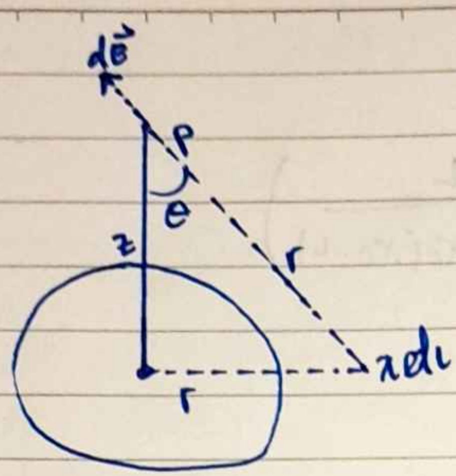

$$\vec{E} = \frac{1}{4\pi\varepsilon_0}\int_0^{2\pi r} \frac{z\lambda\, dl}{(z^2+R^2)^{3/2}}$$

$$= \frac{1}{4\pi\varepsilon_0}\int_0^{2\pi r} \frac{z\lambda\, dl}{(z^2+r^2)^{3/2}}$$

$$= \frac{1}{4\pi\varepsilon_0}\int_0^{2\pi r} \frac{dl}{(z^2+r^2)^{3/2}}$$

$$= \frac{\lambda z}{4\pi\varepsilon_0 (z^2+r^2)^{3/2}}\int_0^{2\pi r} dl \rightarrow \int dl = \int 1\,dl$$

$$= \frac{\lambda z}{4\pi\varepsilon_0 (z^2+r^2)^{3/2}}\, l \Big|_0^{2\pi}$$

$$= \frac{2\lambda z \pi r}{4\pi\varepsilon_0 (z^2+r^2)^{3/2}}$$