No.
Date :

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2)a. Dik: L = L (panjang batang)
rapat muatan : λ
P berjarak z dari ujung batang
$dq = \lambda . dx$
$r = \sqrt{(L-x)^2 + z^2}$
Dit : Ep atas ujung kawat ... ?
Jwb : $dE = \frac{1}{4\pi\varepsilon_0} \cdot \frac{dq}{r^2}$

$= \frac{1}{4\pi\varepsilon_0} \cdot \frac{\lambda dx}{(L-x)^2 + z^2}$

$dE_z = dE \cdot \frac{z}{r}$

$= \frac{1}{4\pi\varepsilon_0} \cdot \frac{\lambda z\, dx}{((L-x)^2 + z^2)^{3/2}}$

$E = \int_0^L dE_z = \frac{\lambda z}{4\pi\varepsilon_0} \int_0^L \frac{dx}{((L-x)^2 + z^2)^{3/2}}$; $u = L - x$

$= \frac{\lambda z}{4\pi\varepsilon_0} \int_0^L \frac{du}{(u^2 + z^2)^{3/2}}$

$E = \frac{\lambda z}{4\pi\varepsilon_0} \cdot \frac{L}{z^2\sqrt{L^2 + z^2}}$

$E = \frac{\lambda}{4\pi\varepsilon_0} \cdot \frac{L}{z\sqrt{L^2 + z^2}}$ //

b. Dik: L = L (panjang batang)
rapat muatan = λ
P berjarak vertikal z dari kawat
kawat membentang dari $-L/2$ ke $L/2$
$dq = \lambda . dx$
$r = \sqrt{x^2 + z^2}$
Dit : Ep tengah - tengah kawat ... ?
Jwb : $dE = \frac{1}{4\pi\varepsilon_0} \cdot \frac{dq}{r^2}$

$$= \frac{1}{4\pi\varepsilon_0} \cdot \frac{\lambda dx}{x^2 + z^2}$$

$$dE_Y = dE \cdot \cos\theta = dE \cdot \frac{z}{\sqrt{x^2+z^2}}$$

$$= \frac{1}{4\pi\varepsilon_0} \cdot \frac{\lambda dx}{x^2+z^2} \cdot \frac{z}{\sqrt{x^2+z^2}}$$

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

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

$$E = \frac{2\lambda z}{4\pi\varepsilon_0} \int_0^{L/2} \frac{dx}{(x^2+z^2)^{3/2}}$$

$$= \frac{2\lambda z}{4\pi\varepsilon_0} \cdot \frac{L/2}{z^2\sqrt{(L/2)^2+z^2}}$$

$$E = \frac{\lambda}{4\pi\varepsilon_0} \cdot \frac{L}{z\sqrt{(L/2)^2+z^2}} \quad //$$

3) Dik : rapat muatan $= \sigma$
jari-jari bola $= R$
Dit : E pada bola (luar & dalam) ... ?
Jwb : E dalam $= 0 \rightarrow r < R$ //

$$Q = \sigma \cdot A$$

$$= \sigma \cdot 4\pi R^2$$

$$E = k\frac{Q}{r^2}$$

$$= \frac{1}{4\pi\varepsilon_0} \cdot \frac{\sigma \cdot 4\pi R^2}{r^2}$$

$$E = \frac{\sigma R^2}{\varepsilon_0 r^2} \rightarrow E_{luar} = \frac{\sigma R^2}{\varepsilon_0 r^2} \rightarrow r \geq R \quad //$$

4) Dik : $\vec{E} = kr^3\hat{r}$
$r = 0$
Dit : a. $\rho(r)$ ... ?
b. Q_{total} ... ?
Jwb : a. $\nabla \cdot \vec{E} = \frac{1}{r^2}\frac{d}{dr}(r^2 E_r)$

$= \frac{1}{r^2}\frac{d}{dr}(kr^5)$

$= \frac{1}{r^2} \cdot 5kr^4$

$= 5kr^2$

$\rho(r) = \varepsilon_0 (\nabla \cdot \vec{E})$

$= 5k\varepsilon_0 r^2$ //

b. $Q = \int_V \rho dV$

$= \int_0^R 5k\varepsilon_0 r^2 \cdot 4\pi r^2 dr$

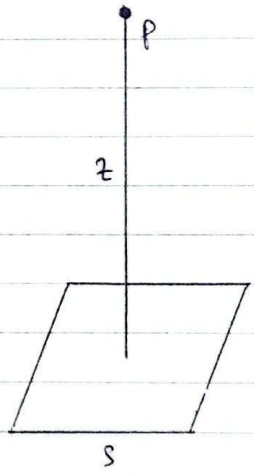
$= 20\pi k\varepsilon_0 \int_0^R r^4 dr$

$= 20\pi k\varepsilon_0 \cdot \frac{R^5}{5}$

$Q = 4\pi k\varepsilon_0 R^5$ //

5) Dik : P sejauh z diatas persegi (sisi = s)
rapat muatan = λ

Dit : E_P ... ?



Jwb : $E_z = \frac{2k\lambda \sin\theta}{z}$; $\theta = \tan^{-1}\left(\frac{s}{2z}\right)$

$E = 4 \cdot \frac{2k\lambda \sin\theta}{z}$ → 4 sisi

$= \frac{8k\lambda \sin\theta}{z}$; $\sin(\tan^{-1}(x)) = \frac{x}{\sqrt{1+x^2}}$

$E = \frac{8k\lambda}{z} \cdot \frac{s}{2z\sqrt{1+(s/2z)^2}}$

$E = \frac{4k\lambda s}{z^2\sqrt{1+s^2/4z^2}}$