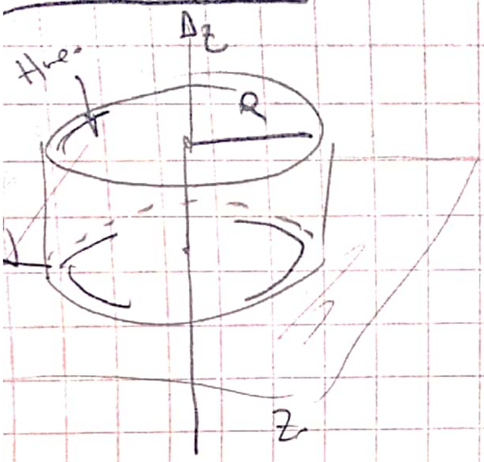
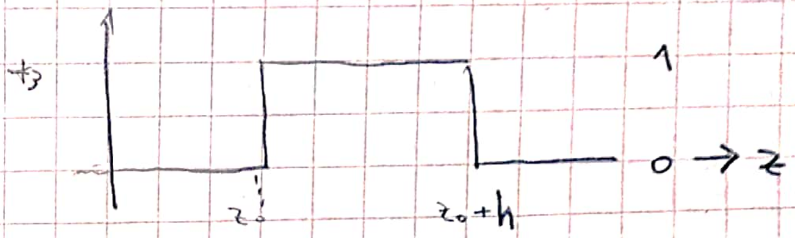
Problema II



1) $\rho(\vec{r}') = \rho_0 \, \delta(r-R] \{ H(z-z_0] - H(z-(z_0+h)] \}$



donde $\rho_0 = \dfrac{Q}{A}$ $/ A = 2\pi R(h+R)$

así:

$$\boxed{\rho(\vec{r}') = \frac{Q}{2\pi R(h+R)} \delta(r-R] \{ H(z-z_0] - H(z-(z_0+h))] \}}$$

en coordenadas cilíndricas

r: radio

z: altura

$\vec{r}(r,\theta,z) = \vec{r}(s,\theta,z)$

2) $$\int_{V'} \frac{\rho(\vec{r}')}{|r-r'|} dV' = \int_0^{2\pi}\int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} \frac{\rho(\vec{r}')}{|r-r'|} s\,ds\,d\phi\,dz$$

$$= \int_0^{2\pi} d\phi \int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} \frac{\rho_0}{(\vec{r}-\vec{r}')} \delta(s-R] \{ H(z-z_0] - H(z-(z_0+h)] \}$$

$\cdot\cdot\ s\,ds\,d\phi\,dz$

$$\int_{-\infty}^{+\infty} \delta(s-R] f(s)\,ds = f(R) \quad ; \quad \int_{-\infty}^{+\infty} \{ H(z-z_0] - H(z-(z_0+h)] \} f(z)\,dz$$

$$\therefore = \int_{z_0}^{h+z_0} f(z)\,dz$$

$$\int_0^{2\pi} d\phi = 2\pi$$

Parte 2 Problema II)

Respuesta 2

$$\int \frac{\rho(\vec{r}\,')}{|\vec{r}-\vec{r}\,'|} dv' = 2\pi \int_{z_0}^{h+z_0} \frac{s'\rho_0}{|\vec{r}-\vec{r}\,'|}\bigg|_{s'=R} dz' = \varphi(\vec{r}) \cdot 4\pi\epsilon_0$$

3) Para $\vec{r} = z\hat{k}$; $\vec{r}\,' = s'\cos\theta'\hat{i} + s'\sin\theta'\hat{j} + z'\hat{k}$

$$|\vec{r}-\vec{r}\,'| = \left[(s')^2 + (z-z')^2\right]^{\frac{1}{2}}$$

$$\varphi(\vec{r}) = \frac{2\pi}{4\pi\epsilon_0} \int_{z_0}^{h+z_0} \frac{s'\rho_0}{\left[(z-z')^2+(s')^2\right]^{\frac{1}{2}}}\Bigg|_{s'=R} dz' = \frac{\rho_0 R}{2\epsilon_0} \int_{z_0}^{h+z_0} \frac{1}{\left[(z-z')^2+R^2\right]^{1/2}} dz'$$

Plot enviado como archivo adjunto