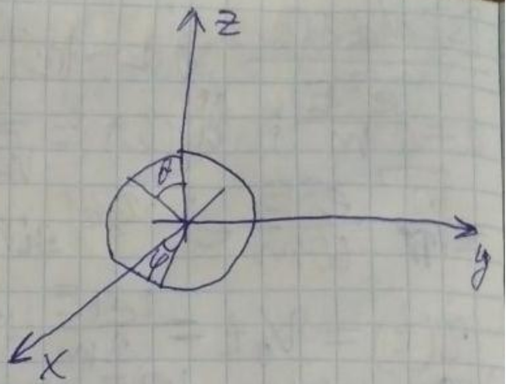
№276 (б)



$$\mu = \frac{1}{2c}\int_V [\vec{r} + \vec{j}(\vec{r})]\, dV$$

$$\vec{j} = \frac{q}{S}[\vec{\omega} \times \vec{r}]$$

$$\mu = \frac{q}{2cS}\int_S r^2(\vec{e}_z - \vec{n}\, n_z)\, dS$$

$$\begin{cases} dS = r^2 \sin\theta\, d\theta\, d\varphi \\ n_z = \cos\theta \\ n_y = \sin\theta \sin\varphi \\ n_x = \sin\theta \cos\varphi \end{cases}$$

$$\mu_z = \frac{q\omega}{2cS}\int_S r^2(1 - n_z^2)\, dS = \frac{q\omega}{2cS}\int_S r^4(1-\cos^2\theta)\cdot$$

$$\cdot \sin\theta\, d\theta\, d\varphi = \frac{q\omega r^4}{2cS}\int_0^{\pi}\sin^3\theta\, d\theta \int_0^{2\pi} d\varphi = \frac{q\omega r^4}{2cS}\cdot$$

$$\cdot 2\pi\left(\frac{\cos^3\theta}{3} - \cos\theta\right)\Big|_0^{\pi} = \frac{q\omega r^4}{2cS}\, 2\pi \cdot \frac{4}{3} =$$

$$= \frac{q\omega r^4}{c4\pi R^2}\,\frac{4\pi}{3} = \frac{q\omega R^2}{3c}$$

$\mu_x = 0$, $\mu_y = 0$

N309

$$A_\varphi = a r (2R_0^2 - r^2)\theta_k(R_0 - r) + \frac{aR^4}{r}\theta_k(r - R_0)$$

$$A_R = 0, \quad A_z = 0$$

$$A_\varphi = \begin{cases} a\, r(2R_0^2 - r^2) \\ \frac{aR^4}{r}, & r > R \end{cases}$$

$$\nabla B = \frac{4\pi}{c} j$$

$$A^1_\varphi = a r (2R_0^2 - r^2), \quad r < R$$

$$A^2_\varphi = \frac{aR^4}{r}, \quad r > R$$

$$A^{(1)}_\varphi\big|_r = aR(2R_0^2 - R_0^2) = aR_0^3$$

$$A^{(2)}_\varphi\big|_r = \frac{aR_0^4}{R_0} = aR_0^3$$

$$\Delta A = \nabla(\nabla\cdot A) = \nabla\times[\nabla\times A]$$

$$\nabla\cdot A = \frac{1}{r}\frac{d}{dr}(rA_R) = \frac{1}{r}\frac{dA_\varphi}{d\varphi} + \frac{dA_z}{dz} = \frac{1}{r}\frac{dR_\varphi}{d\varphi} = 0$$

$$\nabla\times[\nabla\times A] = \frac{4\pi}{c} j$$

$$\nabla\times B = \frac{4\pi}{c} j \Rightarrow B_R = -\frac{dA_\varphi}{dz} = 0, \quad B_\varphi = 0,$$

$$B_z = \frac{1}{r}\left[\frac{d}{dr}(rA_\varphi)\right] = \begin{cases} 4R(R_0^2 - r^2), & r < R \\ 0, & r > R \end{cases}$$

$$\nabla\times B = \frac{4\pi}{c} j \Rightarrow j = \frac{c}{4\pi}\nabla\times B$$

$$\nabla\cdot B = e_r\left[\frac{1}{r}\frac{dB_z}{d\varphi} - \frac{dB_\varphi}{dz}\right] + e_\varphi\left[\frac{dB_r}{dz} - \frac{dB_z}{dr}\right] +$$

$$+ \frac{e_z}{r}\left[\frac{d}{dr}(rB_\varphi) - \frac{dB_r}{d\varphi}\right] = -e_\varphi\frac{dB_z}{dr} =$$

$$= 8ar e_n$$

$$j_r = 0;$$

$$j_\varphi = \begin{cases} 8ar, & r < R \\ 0, & r > R \end{cases}$$

$$j_z = 0$$