Вариант 11 (Кр-2) (Норкин 353)

① $A_r = A_\theta = 0$ $\quad \begin{matrix} r \\ \varphi \\ \theta \end{matrix}$

$A_\varphi = ar\left(\frac{R^2}{3} - \frac{r^2}{5}\right)\sin\theta, \; r<R$

$A_\varphi = 2aR^5/15r^2 \cdot \sin\theta, \quad r>R \qquad , \vec{j} - ?$

$\text{rot rot } \vec{A} = \frac{4\pi \cdot \vec{j}}{c}$

$\vec{A} = \begin{array}{c} \\ \end{array}\begin{array}{ccc} r & \varphi & \theta \end{array}$

$\vec{A} = [0, A_\varphi, 0]$

$$\begin{cases} \text{rot } \vec{A} = \left[-ar\left(\frac{R^2}{3} - \frac{r^2}{5}\right)\cdot\cos\theta, \; 0, \; \left[a\left(\frac{R^2}{3} - \frac{r^2}{5}\right) - \frac{2ar^2}{5}\right]\cdot\sin\theta\right]; \; r<R \\ \text{rot } \vec{A} = \left[-\frac{2aR^5}{15r^2}\cdot\cos\theta, \; 0, \; -\frac{4aR^5}{15r^3}\sin\theta\right] \; ; \; r>R \end{cases}$$

$$\text{rot rot } \vec{A} = \left[0, \; ar\left(\frac{R^2}{3} - \frac{r^2}{5}\right)\sin\theta + \left(\frac{2ar}{5} + \frac{4ar}{5}\right)\sin\theta, \; 0\right], \; r<R$$

$$\text{rot rot } \vec{A} = \left[0, \; \frac{2aR^5}{15r^2}\sin\theta - \frac{12aR^5}{15r^4}\cdot\sin\theta, \; 0\right]$$

$$\vec{j} = \frac{c}{4\pi}\cdot\begin{cases} \left[0, \left(ar\left(\frac{R^2}{3} - \frac{r^2}{5}\right) \cancel{\sin\theta} + \frac{2ar}{5} + \frac{4ar}{5}\right)\sin\theta, \; 0\right], & r<R \\ \left[0, \; \cancel{\sin}\left(\frac{2aR^5}{15r^2} - \frac{12aR^5}{15r^4}\right)\cdot\sin\theta, \; 0\right], & r>R \end{cases}$$

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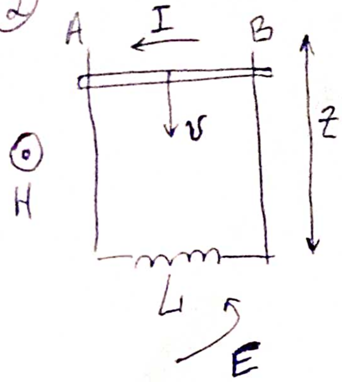

Решение:

$$\Phi = Hlz \qquad E = -\frac{1}{v_c}\frac{d\Phi}{dt} = \frac{-Hl}{v_c}\frac{dz}{dt}$$

$$E + L\frac{dI}{dt} = 0$$

$$-\frac{Hl}{v_c}\frac{dz}{dt} + L\frac{dI}{dt} = 0$$

$$L(I - I_0) = \frac{Hl}{v_c}(z - z_0)$$

$$I = I_0 + \frac{Hl}{v_c}(z - z_0)$$

$$-mg + \frac{I}{v_c}Hl = m\frac{d^2z}{dt^2}$$

$$-mg + \frac{H^2l^2}{v_c^2}(z - z_0) + \frac{I_0 Hl}{v_c} = m\frac{d^2z}{dt^2}$$

$$\cancel{dt^2 = \frac{m}{\frac{H^2l^2}{v_c^2}(z - z_0) - mg + \frac{I_0 Hl}{v_c}}\, d^2z}$$

] $\frac{H^2l^2}{v_c} = a^2$

$$mz'' = a^2z - z_0a^2 - mg + I_0 a$$

$$z'' - \frac{a^2}{m}z = \underbrace{\frac{I_0 a}{m} - \frac{z_0a^2}{m} - g}_{C}$$

$$z(t) = -\frac{Cm}{a^2} + C_1 e^{\frac{at}{\sqrt{m}}} + C_2 e^{-\frac{at}{\sqrt{m}}}$$ – Ответ.