

მაგიდა № 1

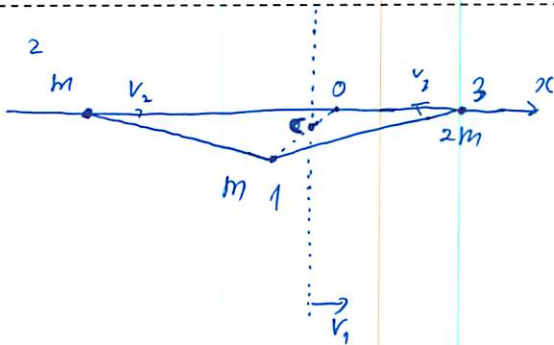
30.04.2014/ ფიზ/II/PH22/

ამოცანა №

1

გვერდი №

1



0-ის 2-ისა და 3-ის ძველი სიჩქარე  
C-ის სიჩქარე ძველი სიჩქარე

$$3 \cdot 0C = C1 \Rightarrow$$

2-ის სიჩქარე სიჩქარე

$$3V_0 = V_1$$

3-ის სიჩქარე სიჩქარე

$$\frac{V_2 + V_3}{2} = V_1 + V_3 \quad (*) \Rightarrow 2V_1 = \frac{V_2 + 3V_3}{2} \quad (1)$$

$$mV_1 + mV_2 - 2mV_3 = 0 \Rightarrow$$

$$V_1 + V_2 = 2V_3 \quad (2)$$

$$(*) \Rightarrow V_2 = 2V_1 - V_3 \quad (2)$$

$$V_1 + 2V_1 - V_3 = 2V_3$$

$$3V_1 = 3V_3 \Rightarrow$$

$$V_1 = V_3 \quad (3)$$

$$(*) \rightarrow (2) = 1$$

$$V_2 + \frac{V_2 + 3V_3}{2} = 2V_3$$

$$3V_2 + 3V_3 = 4V_3$$

$$3V_2 = V_3 \Rightarrow (3) \Rightarrow$$

$$\frac{mV_1^2}{2} + \frac{mV_2^2}{2} + \frac{2mV_3^2}{2} = mgl \quad (4)$$

$$(3) \rightarrow (4) \Rightarrow \frac{3mV_1^2}{2} + \frac{mV_2^2}{2} = mgl$$

$$E = \frac{mV_1^2}{2} + \frac{mV_2^2}{2} + \frac{2mV_3^2}{2} = \frac{mV_1^2}{2} + \frac{mV_2^2}{2} + mgl = \frac{mV_1^2}{2} + \frac{19V_2^2 m}{2}$$

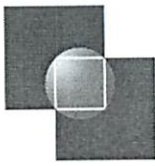
$$\Rightarrow (3) \Rightarrow$$

$$V_1 = \frac{V_2 + 3 \cdot 3V_2}{2} = 5V_2$$

$$mgl = \frac{25V_2^2}{2} + \frac{19V_2^2}{2} = 22V_2^2 \Rightarrow V_2 = \sqrt{\frac{gl}{22}}$$

$$V_1 = 5\sqrt{\frac{gl}{22}}$$

$$V_3 = 3\sqrt{\frac{gl}{22}}$$



მაგიდა № 1

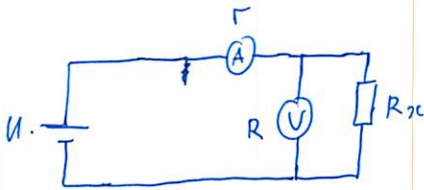
30.04.2014/ ფიზ/II/ PH 221

ამოცანა №

2

გვერდი №

1



$$r + \frac{R_x R}{R_x + R} = R_x$$

$$1 + \frac{10R_x}{10 + R_x} = R_x$$

$$10 + 11R_x = 10R_x + R_x^2$$

$$R_x^2 - R_x - 10 = 0$$

$$D = 1 + 40 = 41$$

$$R_x = \frac{1 + \sqrt{41}}{2} = 3,70 \Omega$$

$$I_1 = \frac{1,53}{3,7 \Omega} = 0,41 \text{ A}$$

$$I_2 = \frac{I_1 \cdot \frac{R_x R}{R_x + R}}{R_x} = 0,29 \text{ A}$$

$$I_1 = \frac{U}{R_x}$$

$$I_2 = \frac{\frac{U}{R_x} \cdot \frac{R_x R}{R_x + R}}{R_x} = \frac{U R}{R_x (R_x + R)} = \frac{U R}{R_x^2 + R_x R}$$

$$I_2 = \frac{I_1 \cdot \frac{R_x R}{R_x + R}}{R_x} = I_1 \cdot \frac{R}{R_x + R}$$

$$q = \frac{R}{R_x + R}$$

$$I_1 + I_2 + \dots =$$

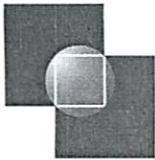
$$= I_1 \cdot \frac{1}{1 - q} = \frac{I_1}{1 - \frac{R}{R_x + R}}$$

$$= \frac{I_1}{\frac{R_x}{R_x + R}} = 1,48 \text{ A}$$

$$U_1 = \frac{I_1 \cdot \frac{R_x R}{R_x + R}}{R} = I_1 \cdot \frac{R_x}{R_x + R}$$

$$U_2 = \frac{I_2 \cdot \frac{R_x R}{R_x + R}}{R} = I_2 \cdot \frac{R_x}{R_x + R}$$

$$\Rightarrow U_1 + U_2 + \dots = (I_1 + I_2 + \dots) \frac{R_x}{R_x + R} = 0,41 \text{ V}$$



მაგიდა № 1

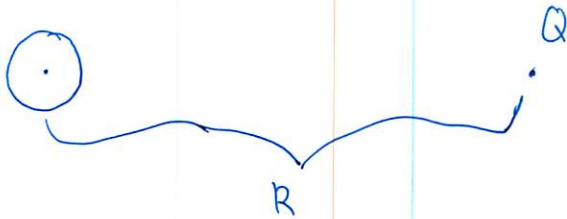
30.04.2014/ ფიზ/II/ PM 221

ამოცანა №

3

გვერდი №

1

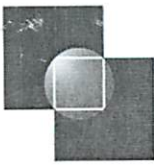


$$\left. \begin{aligned} E_1 &= \frac{kQ}{R^2} \\ E_2 &= \frac{2kq}{2R^2} \end{aligned} \right\} \Rightarrow \frac{Q}{R^2} = \frac{2q}{R^2} \Rightarrow q_1 = \frac{2Q R^2}{2 R^2}$$

$$E_2 = \frac{kQ}{4R^2}$$

$$E_2 = \frac{2kq_2}{2R^2}$$

$$q_2 = \frac{2Q R^2}{2 \cdot 4 R^2}$$



მაგიდა № 1

30.04.2014/ ფიზ/II/ PH221

ამოცანა №

4

გვერდი №

1

1)  $M = mgR = I\alpha$

$$\alpha = \frac{mgR}{I}$$

2)  $mgH = \frac{I\omega^2}{2} + \frac{mV^2}{2} = \frac{I\omega^2}{2} + \frac{mR^2\omega^2}{2} = \frac{\omega^2}{2} (I + mR^2) \Rightarrow$

$$\omega = \sqrt{\frac{2mgH}{I + mR^2}}$$

3)  $mgH = E_s$  *სადაც სივს სივს სივს, სივს სივს სივს სივს*

4) *სადაც სივს სივს სივს სივს*

$$B = \frac{i}{4\pi r} \quad (1)$$

*სადაც სივს სივს სივს სივს*

*სადაც სივს სივს სივს სივს*

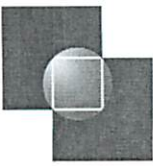
$$i = \frac{I'}{L} = \frac{dq}{dtL} = \frac{\frac{Q}{2\pi r} \cdot dx}{dt \cdot L} = \frac{Q dx}{2\pi r L dt} = \frac{QV}{2\pi r L} = \frac{QW}{2\pi r L} \quad (2)$$

$$B = \frac{i}{4\pi r} \quad (2) \rightarrow (1) \Rightarrow$$

$$B = \frac{4\pi}{4\pi r} \cdot \frac{QW}{2\pi r L} = \frac{QW}{2\pi r L M_0} \quad (3)$$

$$2) E = \frac{\epsilon}{2\pi r} = \frac{d\phi}{dt 2\pi r} = \frac{d\pi R^2 dB}{dt 2\pi r} = \frac{\pi R^2}{2\pi r dt} \cdot \frac{Q dW}{2\pi r L M_0} = \frac{QR}{4\pi r L M_0} \cdot \frac{dW}{dt} =$$

$$= \frac{QR\alpha}{4\pi r L M_0} \quad (4)$$



მაგიდა № 1

30.04.2014/ ფიზ/II/PH221

ამოცანა №

4

გვერდი №

2

3) ~~მეორე~~

$$(4) \Rightarrow E_R = \frac{QR\alpha}{4\pi RLM_0} = \frac{Q\alpha}{4\pi LM_0} \Rightarrow M_R = \frac{Q^2 R \alpha}{4\pi LM_0} \quad (5)$$

$$M_R = E_R QR$$

$$8) \quad mgR - M_R = I\alpha \quad (6)$$

(5)  $\rightarrow$  (6)  $\Rightarrow$

$$mgR - \frac{Q^2 R \alpha}{4\pi LM_0} = I\alpha \Rightarrow$$

$$\alpha \left( I + \frac{Q^2 R}{4\pi L} \right) = mgR \Rightarrow$$

$$\alpha = \frac{mgR}{I + \frac{Q^2 R}{4\pi L}} \quad (7)$$

$$9) \quad \frac{mV_0^2}{2} + \frac{I\omega_0^2}{2} + \frac{L I_0^2}{2} = mgH \quad (8)$$

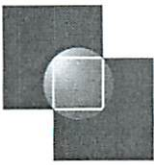
(1), (8)  $\Rightarrow$  ~~მეორე~~  $\frac{L I_0^2}{2} \equiv \Delta E$

$$\Delta E = \frac{L_0 I_0^2}{2} \quad (9)$$

$$L_0 \frac{dI_0'}{dt} = \frac{d\varphi}{dt} \quad (10)$$

$$I_0' = \frac{d\varphi}{dt} = \frac{Q dx}{2\pi R dt} = \frac{QW}{2\pi R} \Rightarrow \frac{dI_0'}{dt} = \frac{Q dW}{2\pi R dt} = \frac{Q\alpha}{2\pi R} \quad (11)$$

$$\frac{d\varphi}{dt} = \frac{\pi R^2 dB}{dt} = \frac{\pi R^2}{dt} \cdot \frac{Q dW}{2\pi R L M_0} = \frac{Q\alpha R}{2 L M_0} \quad (12)$$



მაგიდა № 1

30.04.2014/ ფიზ/II/ PH 22/

ამოცანა №

4

გვერდი №

3

$$(11), (12) \rightarrow (10) \Rightarrow$$

$$L_0 \frac{Q \Delta}{2\pi R} = \frac{Q \Delta R}{2 L M_0} \Rightarrow$$

$$L_0 = \frac{\pi R^2}{L M_0} \quad (13)$$

$$(13) \rightarrow (9) \Rightarrow$$

$$E = \frac{\pi R^2}{2 L M_0} \cdot I_0^2 \quad (14)$$

$$(2) \rightarrow I_0 = \dot{\phi} \cdot L \Rightarrow I_0 = \frac{Q W_0}{2\pi R} \quad (15)$$

$$2 \alpha \frac{H}{R} = W_0^2 \quad (16)$$

$$(7) \rightarrow (16) \Rightarrow W_0^2 = \frac{2H}{R} \cdot \frac{mgR}{I + \frac{Q^2 R}{4\pi L}} = \frac{2mgH}{I + \frac{Q^2 R}{4\pi L}} \quad (17)$$

$$(17) \rightarrow (16) \rightarrow (15) \rightarrow (14) \Rightarrow$$

$$E = \frac{mgH Q^2}{4\pi L M_0 \left( I + \frac{Q^2 R}{4\pi L} \right)}$$