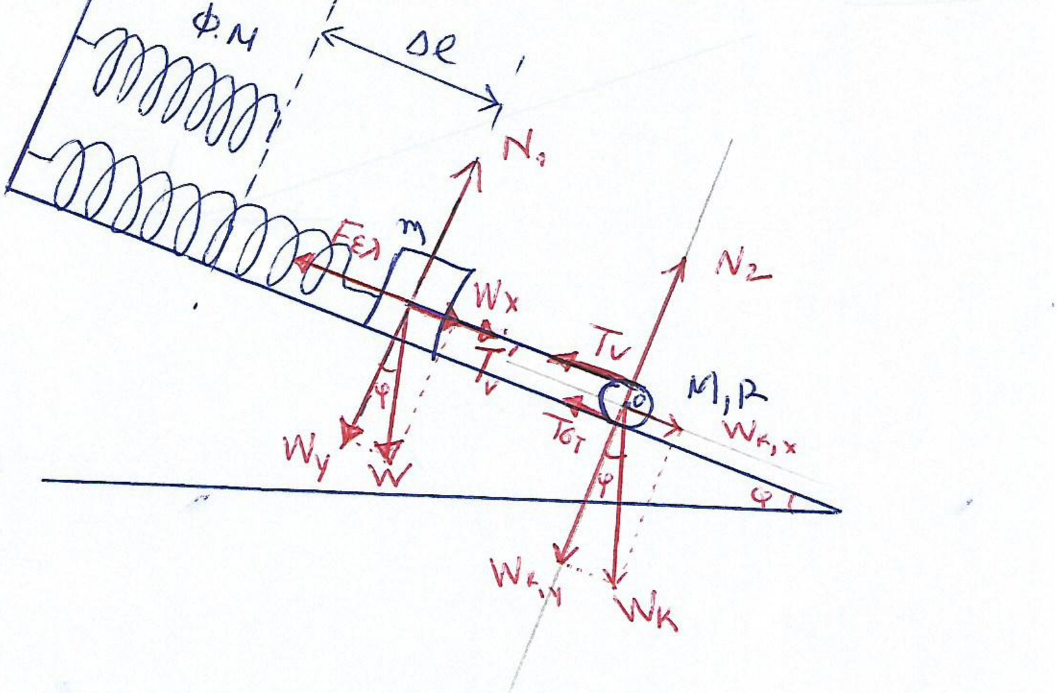
ΘΕΜΑ Δ

Ζ	Δ
Δ1) T_ν	$m = 1kg$
$\Delta\ell$	$K = 100 N/m$
	$\varphi = 30^\circ$
Δ2) $F_{\varepsilon\pi}(t)$	$M = 2kg$
Δ3) L	$R = 0{,}1m$
	$N = \frac{12}{\pi}$
Δ4) $\frac{dK}{dt}$	$t = 3s$
	$I_{cm} = \frac{1}{2}MR^2$



Δ1) Το συστημα ισορροπει αρα:

για τον κυλινδρο:

$$\left.\begin{array}{l} \bullet\ \Sigma F_x = 0 \Rightarrow W_{\kappa,x} - T_\nu - T_{\sigma\tau} = 0 \Rightarrow T_{\sigma\tau} = Mg\,\eta\mu 30 - T_\nu \\ \text{και} \\ \bullet\ \Sigma \tau_0 = 0 \Rightarrow T_\nu \cdot \cancel{R} - T_{\sigma\tau} \cdot \cancel{R} = 0 \Rightarrow T_{\sigma\tau} = T_\nu \end{array}\right\} \Rightarrow$$

$$Mg\,\eta\mu 30 - T_\nu = T_\nu \Rightarrow T_\nu = \frac{Mg\,\eta\mu 30}{2} \Rightarrow \boxed{T_\nu = 5N}$$

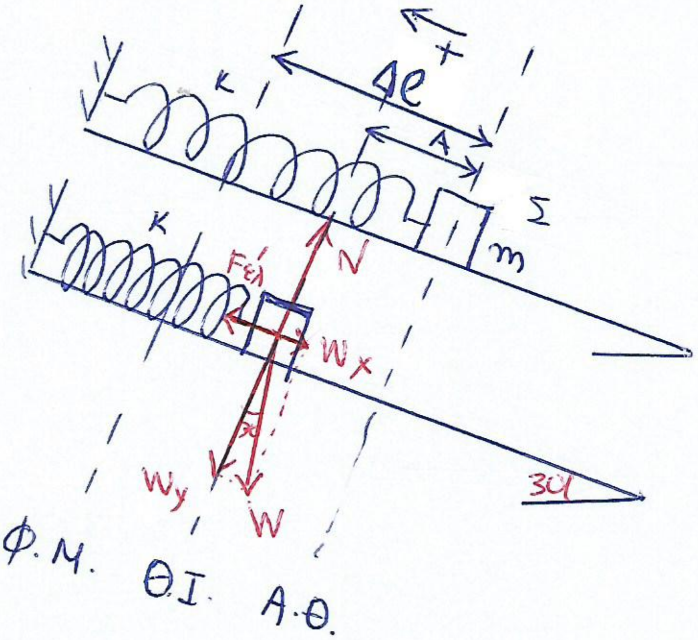
για το Σ:

$$\bullet\ \Sigma F_x = 0 \Rightarrow W_x + T_\nu' - F_{\varepsilon\lambda} = 0 \xrightarrow{T_\nu' = T_\nu} F_{\varepsilon\lambda} = mg \cdot \eta\mu 30 + T_\nu$$

$$\Rightarrow K \cdot \Delta\ell = mg\,\eta\mu 30 + T_\nu \Rightarrow \Delta\ell = \frac{mg\,\eta\mu 30 + T_\nu}{K} \Rightarrow \boxed{\Delta\ell = 0{,}1m}$$

Τηλ.: 210-6219712 / 210-6218894 www.apolito.gr – e-mail:info@apolito.gr
Λεωφόρος Μαραθώνος & Χρυσοστόμου Σμύρνης 3, 14565 Άγιος Στέφανος

Δ2



$t=0$, Α.Θ. $(x=-A)$

Θ.Ι

• Στην Θ.Ι : $\Sigma F_x = 0 \Rightarrow F_{\epsilon\lambda}' = W_x \Rightarrow K\cdot(\Delta\ell - A) = m\cdot g\cdot \eta\mu 30$

$\Rightarrow K\Delta\ell - KA = mg\,\eta\mu 30 \Rightarrow A = \dfrac{K\Delta\ell - mg\,\eta\mu 30}{K}$

$\Rightarrow A = \dfrac{100\,N/m \cdot 0{,}1\,m - 1\,kg\cdot 10\frac{m}{s^2}\cdot\frac{1}{2}}{100\,N/m} \Rightarrow \boxed{A = 0{,}05\,m}$

• $x = A\,\eta\mu(\omega t + \varphi_0) \xrightarrow[x=-A]{t=0} \eta\mu\varphi_0 = -1 = \eta\mu\frac{3\pi}{2} \Rightarrow$

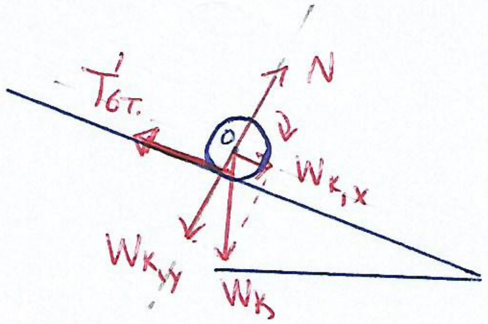
$\left.\begin{array}{l} \varphi_0 = 2\kappa\pi + \frac{3\pi}{2} \\ \text{ή} \\ \varphi_0 = 2\kappa\pi + \pi - \frac{3\pi}{2} \end{array}\right\} \xrightarrow{\kappa=0} \boxed{\varphi_0 = \frac{3\pi}{2}}$ ή $\varphi_0 = \frac{-\pi}{2}$

• $\omega = \sqrt{\dfrac{K}{m}} = \sqrt{\dfrac{100\,N/m}{1\,kg}} \Rightarrow \boxed{\omega = 10\,rad/s}$

$$\Sigma F = -K \cdot x$$

$$\Sigma F = -K \cdot A\, \eta\mu(\omega t + \varphi_0) \Rightarrow \boxed{\Sigma F = -5\, \eta\mu\left(10t + \frac{3\pi}{2}\right)}$$

Δ3)



Ο κύλινδρος κανει μεταφορική και περιστροφική κινηση:

κυλιση χωρις ολισθηση αρα $\alpha_{\gamma\omega\nu} = \frac{\alpha_{cm}}{R}$

- $\Sigma\tau_0 = I_{cm} \cdot \alpha_{\gamma\omega\nu} \Rightarrow T'_{\sigma\tau} \cdot \cancel{R} = \frac{1}{2} M R^{\cancel{2}} \cdot \alpha_{\gamma\omega\nu} \Rightarrow$

$$T'_{\sigma\tau} = \frac{1}{2} M R \cdot \frac{\alpha_{cm}}{\cancel{R}} \Rightarrow T'_{\sigma\tau} = \frac{M \cdot \alpha_{cm}}{2}$$

- $\Sigma F_x = M \cdot \alpha_{cm} \Rightarrow W_{\kappa,x} - T'_{\sigma\tau} = M \cdot \alpha_{cm}$

$\Rightarrow$

$$\cancel{M} \cdot g \cdot \eta\mu 30 - \frac{\cancel{M} \cdot \alpha_{cm}}{2} = \cancel{M} \cdot \alpha_{cm} \Rightarrow \alpha_{cm} = \frac{2 g\, \eta\mu 30}{3} \Rightarrow$$

$$\boxed{\alpha_{cm} = \frac{10}{3}\, m/s^2} \quad \text{και} \quad \alpha_{\gamma\omega\nu} = \frac{\alpha_{cm}}{R} \Rightarrow \boxed{\alpha_{\gamma\omega\nu} = \frac{100}{3} \frac{rad}{s^2}}$$

Οταν εχει περιστραφει κατα N φορες, θα εχει διαγραψει $N = \frac{\theta}{2\pi} \Rightarrow \theta = N \cdot 2\pi = \frac{12}{\pi} \cdot 2\pi \Rightarrow$

$$\boxed{\theta = 24\, rad}$$

$$\theta = \frac{1}{2} \alpha_{\gamma\omega\nu} \cdot t^2 \Rightarrow t = \sqrt{\frac{2\theta}{\alpha_{\gamma\omega\nu}}} \Rightarrow \boxed{t = 1{,}2\, sec}$$

Τηλ.: 210-6219712 / 210-6218894 www.apolito.gr - e-mail:info@apolito.gr
Λεωφόρος Μαραθώνος & Χρυσοστόμου Σμύρνης 3, 14565 Άγιος Στέφανος

Άρα $L = I_{cm} \cdot \omega$

$$L = \frac{1}{2} M \cdot R^2 \cdot a_{γων} \cdot t = \frac{1}{2}\, 2kg\, (0,1m)^2 \cdot \frac{100}{3} \frac{rad}{s^2} \cdot 1,2s$$

$$\Rightarrow \boxed{L = 0,4\, kg \frac{m^2}{s}}$$

Δ4)

$$\frac{dK}{dt} = \Sigma F \cdot υ_{cm} + \Sigma \tau \cdot \omega$$

$$\frac{dK}{dt} = M \cdot a_{cm} \cdot a_{cm} \cdot t + I_{cm} \cdot a_{γων} \cdot a_{γων} \cdot t$$

$$\frac{dK}{dt} = M a_{cm}^2 \cdot t + \frac{1}{2} M \cancel{R^2} \cdot \frac{a_{cm}^2}{\cancel{R^2}} \cdot t$$

$$\frac{dK}{dt} = \frac{3 M a_{cm}^2 t}{2}$$

$$\frac{dK}{dt} = \frac{3 \cdot 2kg \cdot \left(\frac{10}{3} \frac{m}{s}\right)^2 \cdot 3s}{2}$$

$$\boxed{\frac{dK}{dt} = 100\, J/s}$$

Τηλ.: 210-6219712 / 210-6218894 www.apolito.gr – e-mail:info@apolito.gr
Λεωφόρος Μαραθώνος & Χρυσοστόμου Σμύρνης 3, 14565 Άγιος Στέφανος