Kelompok 9

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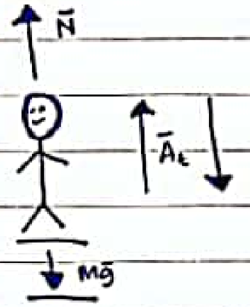
5.1) a.) Pengamat non-inersia percaya bahwa ia berada dalam kesetimbangan dan gaya total yang bekerja padanya adalah nol. Skala memberikan gaya keatas N yang nilainya sama dengan skala berat "w" dari pengamat dalam kerangka yang dipercepat.

Maka :



$$\bar{N} + m\bar{g} - m\bar{A}_0 = 0$$

$$N - mg - mA_0 = N - mg - m\frac{g}{4} = N - \frac{5}{4}mg = 0$$

$$w' = N = \frac{5}{4}mg = \frac{5}{4}w$$

$$w' = 150\text{ lb}$$

b.) Percepatan kebawah searah dengan $\bar{g}$

$$N - mg + m\left(\frac{g}{4}\right) = 0$$

$$w' = w - \frac{w}{4} = \frac{3}{4}w$$

$$w' = 90\text{ lb}$$

5.2) $\bar{F}_{\text{sentrifugal}} = -m\bar{\omega} \times (\bar{\omega} \times \bar{r}')$

Untuk $\bar{\omega} \perp \bar{r}'$. $F_{\text{sentrifugal}} = m\omega^2 r' \hat{e}_{r'}$

$$w = 500\ s^{-1} = 1000\,\pi\,s^{-1}$$

$$= 1000\ \pi/s$$

$$\bar{F}_{\text{sentrifugal}} = 10^{-6} \times (1000\,\pi)^2 \times 5\hat{e}_r = 5\pi^2 \rightarrow \text{keluar}$$

$$\frac{F_{\text{sentrifugal}}}{F_g} = \frac{m\omega^2 r'}{mg}$$

$$= \frac{(1000\,\pi)^2\,5}{980}$$

$$= 5.04 \times 10^4$$

Dipindai dengan CamScanner

5.3) $m\bar{g} + \bar{T} = m\bar{A}_0 = 0$

$-mg\hat{j} + T\cos\theta\,\hat{j} + T\sin\theta\,\hat{i} - m\left(\frac{g}{10}\right)\hat{i} = 0$

$T\cos\theta = mg$

$T\sin\theta = \frac{mg}{10}$

$\tan\theta = \frac{1}{10}$

$\theta = 5{,}71^\circ$

$T = \frac{mg}{\cos\theta}$

$= 1.005\ mg$

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5.4) Pengamat inersia berfikir bahwa $\vec{g}$ menunjuk ke bawah ke arah bola gantung, dengan demikian

$$\vec{g} = \vec{g} - \vec{A}$$
$$= g\hat{j} - \frac{g}{10}\hat{i}$$

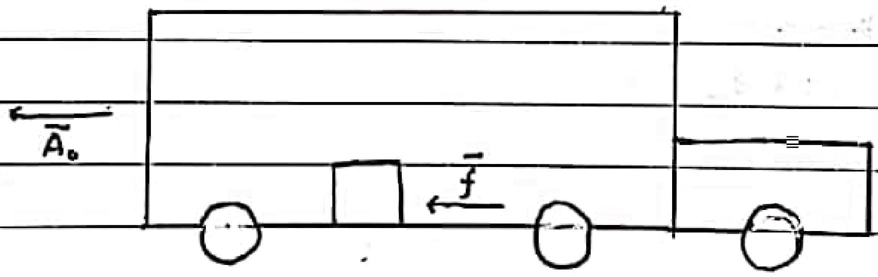
untuk osilasi kecil dari pendulum sederhana

$$T = 2\pi\sqrt{\frac{l}{g'}}$$

$$g' = \sqrt{g^2 + \left(\frac{g}{10}\right)^2} = 1.005\ g$$

$$T = 2\pi\sqrt{\frac{l}{1.005g}}$$
$$= 1.995\pi\sqrt{\frac{l}{g}}$$

5.5) a). $f = -\mu mg$ ⇒ Gaya yang bekerja pada kotak



Sehingga : $f - m\vec{A}_0 = m\vec{a}$

$\vec{a}$ = percepatan relatif box
$\vec{f}$ = Gaya yang bekerja secara horizontal

b). $a = \frac{f}{m} = -\frac{\mu mg}{m} = -\mu g = \frac{-g}{3}$

$A_0 = \frac{-g}{2}$ ⇒ box

$a = a' - A_0 = \frac{-g}{3} + \frac{g}{2} = \frac{g}{6}$ ⇒ Truk

JOYKO 30 Lines, 6 mm

(5.6)

a.) $\vec{r} = \hat{i}\,(x_0 + R\cos \Omega t) + \hat{j}\, R \sin \Omega t$

$\dot{\vec{r}} = -\hat{i}\,\Omega R \sin \Omega t + \hat{j}\,\Omega R \cos \Omega t$

$\dot{\vec{r}} \cdot \dot{\vec{r}} = v^2 = \Omega^2 R^2$

$v = \Omega R$

b.) $\dot{\vec{r}} = \dot{\vec{r}} - \vec{\omega} \times \vec{r}$ ketika $\vec{r} = \hat{i}\,x' + \hat{j}\,y'$

$= -\hat{i}\,\Omega R \sin \Omega t + \hat{j}\,\Omega R \cos \Omega t - \omega \hat{k} \times (\hat{i}x' + \hat{j}y')$

$= -\hat{i}\,\Omega R \sin \Omega t + \hat{j}\,\Omega R \cos \Omega t - \hat{j}\,\omega x' + \hat{i}\,\omega y'$

$\dot{x}' = \omega y' - \Omega R \sin \Omega t$

$\dot{y}' = -\omega x' + \Omega R \cos \Omega t$

c.) $u' = x' + iy'$. $i = \sqrt{-1}$!

$\dot{u}' = \dot{x}' + i\dot{y}' = \omega y' - \Omega R \sin \Omega t - i\omega x' + i\Omega R \cos \Omega t$

$i\omega u' = - \omega y' + i\omega x'$

$\Rightarrow \dot{u}' + i\omega u' = -\Omega R \sin \Omega t + i\,\Omega R \cos \Omega t = i\Omega R e^{i\Omega t}$

$u' = Ae^{-i\omega t} + Be^{i\Omega t}$

$\dot{u}' = -i\omega A e^{-i\omega t} + i\Omega B e^{i\Omega t}$

$i\omega u' = i\omega A e^{-i\omega t} + i\omega B e^{i\omega t}$

$\Rightarrow \dot{u} + i\omega u' = i\,(\omega + \Omega)\, Be^{i\omega t}$, maka $B = \frac{\Omega R}{\omega + \Omega}$

$u' = A + B = x'(0) + iy(0) = x_0 + R$

$\Rightarrow A = x_0 + R - B$

$= x_0 + R - \frac{\Omega R}{\omega + \Omega}$, maka $A = x_0 + \frac{\omega R}{\omega + \Omega}$

$$u' = \left[x_0 + \frac{\omega R}{\omega + \Omega}\right] e^{-i\omega t} + \frac{\Omega R}{\omega + \Omega}\, e^{i\omega t}$$

(5.7)

a.) $\overset{s}{n}(t) = \begin{matrix} Ra \cos \omega at \\ Ra \sin \omega at \end{matrix}$

$\overset{s}{e}(t) = \begin{matrix} Re \cos \omega et \\ Re \sin \omega et \end{matrix}$

$\frac{e}{a} = \frac{s}{a} \cdot \frac{s}{e}$

$\frac{e}{a}(t) = \begin{matrix} Ra \cos \omega at - Re \cos \omega et \\ Ra \sin \omega at - Re \sin \omega et \end{matrix}$

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$r_a^e = r^s a - r^s e$

$$r_a^e(t) = \begin{bmatrix} Ra \cos wat - Re \cos wet \\ Ra \sin wat - Re \cos wet \end{bmatrix}$$

b.) $V^e a(t) = \frac{d}{dt} ra^e(t)$

$$\begin{bmatrix} -\omega a\, Ra \sin \omega at + \omega e\, Re \sin \omega et \\ \omega a\, Ra \cos \omega at - \omega e\, Re \cos \omega et \end{bmatrix}$$

$t = 0$

$$V^e a(t) = 0 \begin{bmatrix} 0 \\ \omega a Ra - \omega e Re \end{bmatrix}$$

c.) $a^e a(t) = \frac{d}{dt} Va^e(t)$

$$= \begin{bmatrix} -\omega a^2 Ra \cos wat + \omega e^2 Re \sin wet \\ -\omega a^2 Ra \sin wat + \omega e^2 Re \cos wet \end{bmatrix}$$