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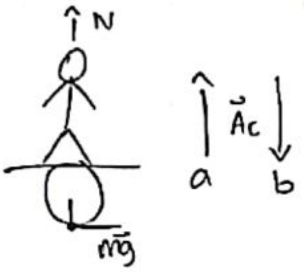
Kelompok 3

(5.1) a]



$\vec{N} + m\vec{g} - m\vec{A_0} = 0$

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

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

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

$\omega' = \underline{\underline{15016}}$

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

$\omega' = \omega - \frac{V_1}{4} = 3/4\, \omega$

$\omega' = \underline{\underline{9016}}$

(5.2) a] $\vec{F}_{cent} = -m\vec{\omega} \times (\vec{\omega} \times \vec{r})$

untuk $\vec{\omega} \perp \vec{r} \Rightarrow F_{cent} = m\omega^2 r' \hat{e}_r$

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

$F_{cent} = 10^{-6} \times (1000\pi)^2 \times 5\, \hat{E}_r = \underline{\underline{5\pi^2}}$

b] $\frac{F_{cent}}{F_g} = \frac{m\omega^2 r'}{mg}$

$= \frac{(1000\pi)^2\, 5}{980} = \underline{\underline{5{,}04 \times 10^4}}$

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5.3. $\vec{Mg} + \vec{T} - m\vec{A_c} = 0$

$-mg\hat{j} + T\cos\theta\hat{j} + T\sin\theta i - m(9/10)\hat{i} = 0$

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

$\tan\theta = \frac{1}{10} \Rightarrow \theta = 5{,}71$

$T = \frac{mg}{\cos\theta} = 1.005\ mg$

5.4. $\vec{g'} = \vec{g} - \vec{A_0} = g\hat{i} - \frac{g}{10}\hat{i}$

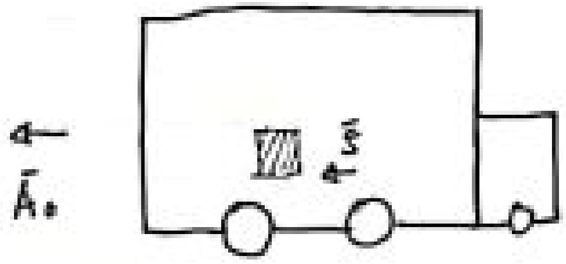
untuk osilasi kecil pada pendulum sederhana :

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

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

$T = 2\pi\sqrt{\frac{1}{1.005g}} = 1.995\pi\sqrt{\frac{1}{g}}$

5.5 (a) : $f = -\mu mg$ pada frictional force acting on the



bok, lalu

$\bar{f} - m\bar{A}_0 = m\bar{a}$

Sekarang, f adalah freq force, maka:

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

$A = -\frac{g}{2}$. Dari atas, $ma - mA_0 = m a'$

Maka jawaban (a) adalah

$a' = a - A_0 = -\frac{g}{3} + \frac{g}{2} = \frac{5}{6}$

5.6 Jawaban :

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

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

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

$v = \Omega R$

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

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

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

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

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

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

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

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

$\Rightarrow u^{-1} + i\omega u' = -\Omega R\sin\Omega t + i\Omega R\cos\Omega t = i\Omega R e^{i\Omega t}$

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

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

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

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

$u' = A + B = x'(0) + iy(0) = X_0 + R$

$\Rightarrow A = X_0 + R - B$

$= X_0 + R - \dfrac{\Omega R}{\omega + \Omega}$, maka $A = X_0 + \dfrac{\omega R}{\omega + \Omega}$

$$u' = \left[X_0 + \frac{\omega R}{\omega + \Omega}\right]e^{-i\omega t} + \frac{\Omega R}{\omega + \Omega}e^{i\omega t}$$

5.7. a). $s_n(t) = \begin{matrix} Ra \cos w_a t \\ Ra \sin w_a t \end{matrix}$

$s_e(t) = \begin{matrix} Re \cos w_e t \\ Re \sin w_e t \end{matrix}$

$e_a = s_a - s_e$

$e_a(t) = \begin{matrix} Ra \cos w_a t - Re \cos w_e t \\ Ra \sin w_a t - Re \sin w_e t \end{matrix}$

$r_a^e = r^s_a - r^s_e$

$r^e_a(t) = \begin{bmatrix} Ra \cos w_a t - Re \cos w_e t \\ Ra \sin w_a t - Re \sin w_e t \end{bmatrix}$

b) $v^e_a(t) = \frac{d}{dt} r_a^2(t)$

$\begin{bmatrix} -w_a Ra \sin w_a t + w_e Re \sin w_e t \\ w_a Ra \cos w_a t - w_e Re \cos w_e t \end{bmatrix}$

$t=0$

$V^e_a(t) = 0 \begin{bmatrix} 0 \\ w_a Ra - w_e Re \end{bmatrix}$

c)

$a^e_a(t) = \frac{d}{dt} V_a^e(t) =$

$\begin{bmatrix} -w_a^2 Ra \cos w_a t + w_e^2 Re \sin w_e t \\ -w_a^2 Ra \sin w_a t + w_e^2 Re \cos w_e t \end{bmatrix}$