Solusi Soal Prediksi 2 UTS I (Created by Wawan Kurniawan)

(1) $\vec{r} = 5t\hat{i} + (et + ft^2)\hat{j}$

a) kecepatan partikel :

$$\vec{v} = \frac{d\vec{r}}{dt} = 5\hat{i} + (e + 2ft)\hat{j}$$

Arah sudut gerak partikel :

$$\theta = \tan^{-1}\left(\frac{V_y}{V_x}\right)$$

$$= \tan^{-1}\left[(e + 2ft)/5\right]$$

Pada saat $t = 0$, $\theta_0 = 35^\circ \rightarrow$ maka :

$$\tan\theta_0 = \frac{e + 2f(0)}{5}$$

$$\tan 35 = \frac{e}{5}$$

$$e = 5 \tan 35^\circ$$

$$e = 3{,}5 \text{ m/s}$$

b)
Pada saat $\theta = 0$, $t = 14$ s,

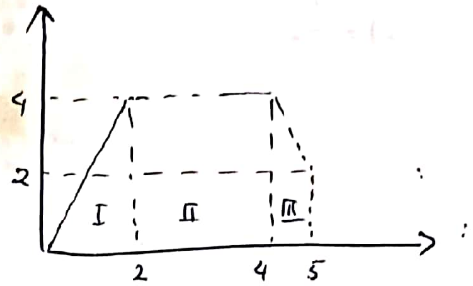
$$\boxed{\tan\theta = \frac{V_y}{V_x} = \frac{\theta}{t}}$$

maka, $V_y = (e + 2ft) = 0$

$\theta = (e + 2ft) = 0$

Jadi, $f = \frac{-e}{2t} = \frac{-3{,}5}{2(14)} = -0{,}125 \text{ m/s}^2$

(2) a. Cara I dengan Cara luas grafik



$$X = L_I + L_{II} + L_{III}$$

$$= \tfrac{1}{2}(2)4 + (2 \cdot 4) + \frac{(4+2)}{2} \cdot 1$$

$$= 4 + 8 + 3$$

$$x = 15 \text{ m}$$

Cara II

$t = 0 \rightarrow t = 2$

$$\vec{r} = \vec{r}_0 + \int v\,dt$$

$$= 0 + \int_0^2 2t\,dt$$

$$= t^2\Big|_0^2$$

$$= 4$$

$t = 2 \rightarrow t = 4$

$$\vec{r} = 4 + \int_2^4 4\,dt$$

$$= 4 + 4t\Big|_2^4$$

$$= 4 + (16 - 8)$$

$$= 4 + 8 = 12$$

$t = 4 \rightarrow t = 5$

$$r = r_0 + \int v\,dt$$

$$= 12 + \int_4^5 (-2t + 12)\,dt$$

$$= 12 + \left[-t^2 + 12t\right]_4^5$$

$$= 12 + \left[(-25 + 60) - (-16 + 48)\right]$$

$$\vec{x}(5) = 12 + 3 = 15 \text{ m}$$

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b) pada saat $t = 5$, pers garisnya :

$$\vec{V} = -2t + 12$$

$$\vec{V}(5) = -2(5) + 12 = 2\ m/s\ \hat{i}$$

c) Percepatan partikel pada $t = 5\ s$:

$$\vec{a} = \frac{d\vec{V}}{dt} =$$

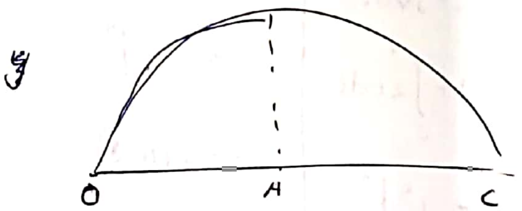
$$= \frac{d}{dt}(-2t + 12)$$

$$\vec{a} = -2\ m/s^2\ \hat{i}$$

d) $$\bar{V} = \frac{x(5) - x(1)}{5 - 1} = 3,5\ m/s$$

e) $$\bar{a} = \frac{V(5) - V(1)}{5 - 1} = \frac{2\ m/s - 2\ m/s}{4} = 0\ m/s^2$$

3) Persamaan gerak selama di udara.



$$t_{OAC} = 2\ t_{OA}$$

$$t_{max} = 2\left(\frac{V_0 \sin\alpha}{g}\right)$$

$$t_{max} = \frac{2\ V_0}{g} \quad (\sin\alpha = 1)$$

maka :

$$\frac{1}{2}\ t_{max} = \frac{V_0}{g}$$

Karena dipilih $\theta_0 \rightarrow$ (jangkauan maximum) $\rightarrow$ menjadi $0,5\ t_{max}$, maka :

$$t = \frac{2\ V_0 \sin\theta_0}{g}$$

$$\frac{\cancel{V_0}}{\cancel{g}} = \frac{2\cancel{V_0}\sin\theta_0}{\cancel{g}}$$

$$\boxed{\sin\theta_0 = \frac{1}{2}}$$

$$\theta_0 = 30^\circ$$

Pada saat $t \rightarrow \frac{1}{2}\ t_{max}$

$$V_x = V_0 \cos 30^\circ$$

dari grafik $$R = \frac{V_0^2 \sin 2\theta_0}{g}$$

$$240 = \frac{V_0^2 \sin 2(45)}{9,8}$$

$$V_0 = 48,5\ m/s$$

maka : $$\vec{V} = (48,5) \cos 30^\circ$$

$$= 42\ m/s$$

4) 1 periode = 20 s

1 periode $\rightarrow$ 1 putaran penuh.

maka : $$V = \frac{2\pi r}{T}$$

$$= \frac{2(3,14)(3)}{20}$$

$$\vec{V} = 0,942\ m/s$$

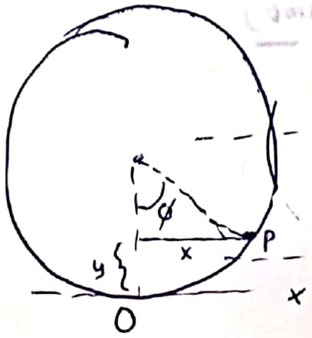
4) a) • pada $t = 5\ s$

Partikel telah berjalan sejauh

$$\frac{t}{T} = \frac{5}{20} = \frac{1}{4} \text{ bagian putaran.}$$

Relatif terhadap pusat lingkaran (O).

$$\phi = \frac{1}{4}(360^\circ) = 90^\circ$$



maka : $x = R \sin\phi$

$y = R - R\cos\phi$

pada saat $\phi = 90^\circ$

$x = R \sin 90^\circ = 3\ m$

$y = R - R\cos 90^\circ = 3\ m$

maka posisinya : $\vec{r} = ((3)\hat{i} + (3)\hat{j})\ m$

b) Pada saat $t = 7{,}5\ s$

fraksi perjalanan partikel $\frac{7{,}5}{20} = \frac{3}{8}$

$$\phi = \frac{3}{8} \times 360^\circ = 135^\circ$$

maka : $x = R \sin 135^\circ = 2{,}1\ m$

$y = R - R\cos 135^\circ = 5{,}1\ m$

posisinya : $\vec{r} = (2{,}1\,\hat{i} + 5{,}1\,\hat{j})\ m$

c) Pada $t = 10\ s$

fraksi perjalanan partikel :

$$\frac{10}{20} = \frac{1}{2}$$

$$\phi = \frac{1}{2}(360^\circ) = 180^\circ$$

maka : $x = R \sin 180^\circ = 0$

$y = R - R\cos 180^\circ = 6\ m$

∴ posisinya $\vec{r} = 6\hat{j}\ m$

5)

$x = V_{ox} \cdot t$

$t = \frac{x}{V_{ox}}$ ....1)

$V_y = V_{oy} - gt$

$V_y = V_{oy} - \frac{gx}{V_{ox}}$ ...... 2)

kemiringan grafik :

$$m = \frac{\Delta V_y}{\Delta x} = \frac{0-5}{10-1} = -\frac{1}{2}$$

dari pers (2)

$$V_y - V_{oy} = \frac{-gx}{V_{ox}}$$

$$\frac{\Delta V_y}{x} = -\frac{g}{V_{ox}}$$

$$-\frac{1}{2} = -\frac{g}{V_{ox}}$$

$$V_{ox} = 2\,(9{,}8) = 19{,}6\ m/s$$

Dari grafik $V_{oy} = 5\ m/s$

$$\theta_0 = \tan^{-1}\left(\frac{V_{oy}}{V_{ox}}\right) = 14{,}3^\circ \approx 14^\circ$$

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⑥ Pada saat setimbang :

$$\Sigma F_y = 0$$

$$T - Mg = 0$$

$$T = Mg, \quad \ldots\ldots 1)$$

Sedangkan Tali juga merupakan gaya yang menjaga benda m (1,5 kg) berputar,

$$T = \frac{mv^2}{R} \quad \ldots\ldots 1)$$

sehingga pers (1) dan (2)

$$Mg = \frac{mv^2}{R}$$

$$V = \sqrt{\frac{MgR}{m}}$$

$$= \sqrt{\frac{(2,5)(9,8)(0,20)}{1,5}}$$

$$V = 1,81 \text{ m/s}$$

⑦ a) Tinjau sumbu y :

$$\Sigma F_y = 0$$

$$N + F\sin\theta - mg = 0$$

$$N = mg - F\sin\theta \quad \ldots\ldots 1)$$

balok mulai bergerak, berarti $a = 0$ dan $f_s = f_{s\,maks}$.

maka :

$$\Sigma F_x = 0$$

$$F\cos\theta - f_s = 0 \quad \ldots\ldots 2)$$

$$F\cos\theta = \mu_s N$$

$$F\cos\theta = \mu_s(mg - F\sin\theta)$$

$$F = \frac{\mu_s(mg - F\sin\theta)}{\cos\theta} \quad \ldots\ldots 3)$$

$$F = \frac{0{,}42(180 - F\sin 42)}{\cos 42^\circ}$$

$$F = 74\,N$$

b) Dari pers (3) no 7a, didapt :

$$F = \frac{\mu_s(W - F\sin\theta)}{\cos\theta}$$

$$F\cos\theta + \mu_s F\sin\theta = \mu_s W$$

$$F(\mu_s\sin\theta + \cos\theta) = \mu_s W$$

$$\boxed{F = \frac{\mu_s W}{\cos\theta + \mu_s \sin\theta}}$$

c) Kita akan mencari F_{min}, jika :

$$\frac{dF}{d\theta} = 0$$

$$\frac{\mu_s W(\sin\theta - \mu_s\cos\theta)}{(\cos\theta + \mu_s\sin\theta)^2} = 0$$

didapat $\theta = \tan^{-1}\mu_s = 23^\circ$

8. Gaya sentripetal penumpang $F = \frac{mv^2}{r}$

a) kemiringan kurva pada $V = 8{,}3$ m/s

$$\left.\frac{dF}{dV}\right|_{v=8,3} = \left.\frac{2mv}{r}\right|_{v=8,3} = \frac{2(85)(8,3)}{3,5}$$

$$= 403\ N.s/m$$

b) periode besarnya : $T = \frac{2\pi r}{V}$

Kemiringan garis pada $T = 2{,}5$ s, adalah :

$$F = \frac{mv^2}{r} = \frac{m}{r}\left(\frac{2\pi r}{T}\right)^2 = \frac{4\pi^2 mr}{T^2}$$

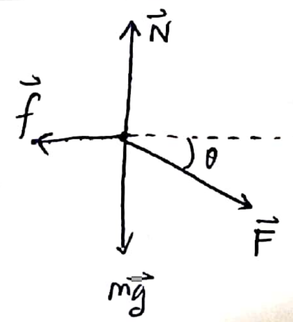
$$dF = -\frac{8\pi^2 mr}{T^3}\, dT$$

$$\left.\frac{dF}{dT}\right|_{T=2,5} = \left.-\frac{8\pi^2 mr}{T^3}\right|_{T=2,5}$$

$$= -\frac{8\pi^2(85)(3,5)}{(2,5)^3}$$

$$\frac{dF}{dT} = -1{,}5 \times 10^3\ N/s$$

9. Gambar diagram bebas balok :



$$\Sigma F_x = ma$$

$$F\cos\theta - f = ma$$

$$\Sigma F_y = 0$$

$$N - F\sin\theta - mg = 0$$

$$N = mg + F\sin\theta$$

gaya gesek : $f = \mu_k . N$

$$= \mu_k (mg + F\sin\theta)$$

maka (arah sumbu-x)

$$F\cos\theta - \mu_k(mg + F\sin\theta) = ma$$

$$a = \frac{F}{m}(\cos\theta - \mu_k\sin\theta) - \mu_k g \quad ---- 1)$$

•) Dari grafik, kita lihat, $a = 3$ m/s² ketika $\mu_k = 0$

$$3 = \frac{F}{m}\cos\theta \quad ---- 2)$$

•) $a = 0 \longrightarrow$ ketika $\mu_k = 0{,}20$:

$$0 = \frac{F}{m}(\cos\theta - (0,2)\sin\theta) - (0,2)(9,8)$$

$$0 = \frac{F}{m}\cos\theta - \frac{F}{m}(0,2)\sin\theta - (0,2)(9,8)$$

$$= 3 - 0,2\frac{F}{m}\sin\theta - 1,96$$

$$= 1,04 - 0,2\frac{F}{m}\sin\theta$$

$$\frac{F}{m}\sin\theta = 5,2\ m/s^2 \quad ---- 3)$$

bagi pers (3) dan pers (2)

$$\frac{\sin\theta\ \frac{F}{m}}{\cos\theta\ \frac{F}{m}} = \frac{5,2}{3} \rightarrow \tan\theta = \left(\frac{5,2}{3}\right) = 1,73$$

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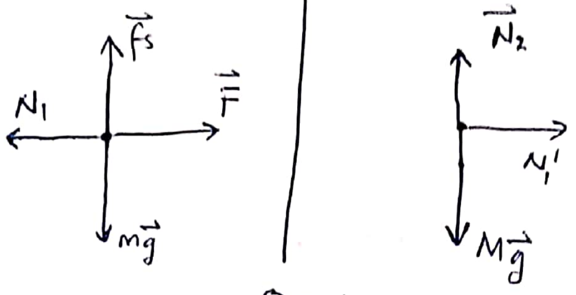
(10)

Diagram bebas :

Benda kecil (m) | Benda besar (M)



① Tinjau sistem

$$F + N_1' - N_1 = m_{tot}\, a$$

$$F = m_{tot}\, a$$

$$a = \frac{F}{m+M}$$

$$f_s = f_{s\,max}$$

$$f_s = \mu_s N_1 \quad , \mu_s = 0{,}38$$

Tinjau balok m

$$\Sigma F_x = ma$$

$$\vec{F} - N_1 = ma \Rightarrow N_1 = F - m\left(\frac{F}{m+M}\right)$$

$$\Sigma F_y = 0$$

$$f_s = mg$$

$$\mu_s N_1 = mg$$

$$\mu_s\left(F - m\left(\frac{F}{m+M}\right)\right) = mg$$

$$\mu_s F - \frac{\mu_s F m}{m+M} = mg$$

$$\mu_s F\left(1 - \frac{m}{m+M}\right) = mg$$

$$\cancel{F = \mu_s\, m}$$

$$\boxed{F = \frac{mg}{\mu_s\left(1 - \frac{m}{m+M}\right)}}$$

Sehingga :

$$F = \frac{mg}{\mu_s\left(1 - \frac{m}{m+M}\right)}$$

$$F = 4{,}9 \times 10^2\ N$$

(11)

$$W = \Delta K$$

$$Fd = \Delta K \quad , \text{dimana } d = \sqrt{x_1^2 + h^2} - \sqrt{x_2^2 + h^2}$$

$$= \sqrt{3^2 + 1{,}2^2} - \sqrt{1^2 + 1{,}2^2}$$

$$= 3{,}23 - 1{,}56$$

$$d = 1{,}67\ m$$

Maka:

$$\Delta K = Fd$$

$$= (25)(1{,}67)$$

$$= 41{,}7 \text{ joule}$$

(12) a) pegas tertekan sejauh $d = 0{,}12\ m$,

Usaha oleh gaya gravitasi :

$$W_1 = mgd = 0{,}25\,(9{,}8)(0{,}12) = 0{,}29\ J$$

b) Usaha oleh gaya pegas :

$$W_2 = \int F\, dy$$

$$= \int -ky\, dy$$

$$= -\frac{1}{2} k y^2$$

$$= -\frac{1}{2} k d^2$$

$$= -\frac{1}{2}\,(250)\,(0{,}12)^2$$

$$W_2 = -1{,}8\ J$$

12). c) : Teorema usaha energi

$$W = \Delta K$$

$$W_1 + W_2 = 0 - \frac{1}{2} m v_i^2$$

$$0{,}29 - 1{,}8 = -\frac{1}{2} m v_i^2$$

$$v_i = \sqrt{\frac{(-2)[(0{,}29) - 1{,}8]}{0{,}25}}$$

$$= 3{,}5 \text{ m/s}$$

d) $v_i' = 2 v_i$

$$= 2(3{,}5) = 7 \text{ m/s}$$

$$W' = \Delta K'$$

$$W_1' + W_2' = \Delta k'$$

$$mgd' - \frac{1}{2} k d'^2 = 0 - \frac{1}{2} m v_i'^2$$

$$d' = \frac{mg + \sqrt{m^2 g^2 + mk v_i'^2}}{k}$$

$$d' = 0{,}23 \text{ m}$$

(13) Karena tidak ada percepatan, gaya yang menarik = berat objek.

Tarikan tangan $\vec{F}$ sama dengan besar T

a) $\Sigma F_y = 0$

kita tinjau katrol :

$$2T - mg = 0 \rightarrow T = \frac{1}{2} mg$$

maka : $|\vec{F}| = T$

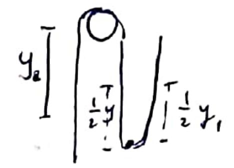
$$= \frac{1}{2} mg$$

$$= \frac{1}{2} 20 (9{,}8)$$

$$|\vec{F}| = 98 \text{ N}$$

b) untuk mengangkat $m = 0{,}02$ m,

maka tali menarik sejauh $0{,}04$ m



$$F = ma \rightarrow y = \frac{1}{2} a t^2$$

$$F \sim y$$

$$\frac{T}{\frac{1}{2} T} = \frac{y_2}{y_1}$$

$$y_2 = 2 y_1$$

maka : $y_2 = 2(0{,}02) = 0{,}04$ m.

c). $W = \vec{F} \cdot \vec{d}$

$$= (98 \text{ N})(0{,}04)$$

$$= 3{,}9 \text{ J}$$

$$W_{gravitasi} = \vec{F_g} \cdot \vec{d_c}$$

$$= -(196) \cdot (0{,}02)$$

$$= -3{,}9 \text{ J}$$

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(14) Pada titik terendah dan titik awal

$$\Delta EM = 0$$

$$EM_i = EM_f$$

$$U_i + K_i = U_f + K_f$$

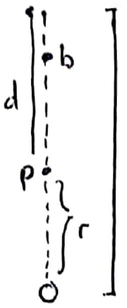
$$mgL + 0 = 0 + \frac{1}{2}mv^2$$

$$V = \sqrt{2gL}$$

$$= \sqrt{2(9,8)(1,2)}$$

$$\vec{V} = 4,85 \text{ m/s}$$

(14) Kita tinjau titik maksimum putaran di titik P.



$$\Delta EM = 0$$

$$y_b = 2r$$

$$r = L - d = 0,45$$

Tinjau titik awal dan b.

$$\Delta EM = 0$$

$$K_f + U_f = U_i + K_i$$

$$\frac{1}{2}mv_b^2 + mg\,y_b = mgL + 0$$

$$V_b = \sqrt{2gL - 2g(2r)} = 2,42 \text{ m/s}$$

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(15)

$$\Sigma F_x = m\,a_{sp}$$

$$T - mg = \frac{mv^2}{r} \quad \ldots\ldots 1)$$

Dengan menerapkan Hukum kekekalan energi mekanik :

$$\Delta EM = 0$$

$$EM_i = EM_f$$

$$mg = \frac{1}{2}mv^2$$

$$v^2 = 2gh \quad \ldots\ldots 2)$$

Substitusi pers (2) ke pers (1) :

$$T = mg + \frac{mv^2}{r}$$

$$T = mg + m\frac{2gh}{r}$$

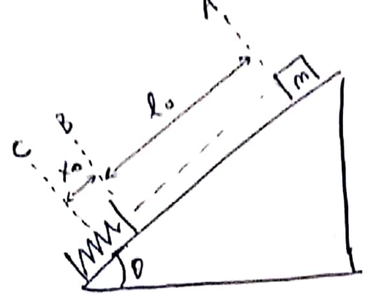
$$= mg\left(1 + \frac{2h}{r}\right)$$

$$= 688\left(1 + \frac{2(3,2)}{18}\right)$$

$$T = 933 \text{ N}$$

Jadi, tali tidak putus.

(16)



$$k = \frac{F}{x} = \frac{270}{0{,}02} = 1{,}35 \times 10^4 \, N/m$$

Jarak antara A dan B = l_o

Total pergeseran : $l_o + x_o$

$$\sin\theta = \frac{h_A}{l_o + x_o}$$

a) Dengan menggunakan energi mekanik :

$$\Delta EM = 0$$

$$EM_A = EM_C$$

$$K_A + U_A = K_C + U_C$$

$$0 + mgh_A = \frac{1}{2} k x_o^2$$

$$h_A = \frac{k x_o^2}{2mg} = \frac{(1{,}35 \times 10^4)(0{,}055)^2}{2(12)(9{,}8)}$$

$$= 0{,}174 \, m$$

Sehingga total jarak tempuh :

$$l_o + x_o = \frac{h_A}{\sin 30^\circ}$$

$$= \frac{0{,}174}{\frac{1}{2}}$$

$$l_o + x_o = 0{,}347 \, m \approx 0{,}35 \, m$$

b) $l_o + x_o = 0{,}347$

$$l_o = 0{,}347 - 0{,}055 = 0{,}292 \, m$$

$$|\Delta y| = h_A - h_B$$

$$= l_o \sin\theta$$

$$= (0{,}292 \sin 30^\circ)$$

$$= 0{,}146 \, m$$

Kita tinjau titik A dan B :

$$EM_A = EM_B$$

$$0 + mgh_A = \frac{1}{2} m v_B^2 + mgh_B$$

$$mgh_A - mgh_B = \frac{1}{2} m v_B^2$$

$$\cancel{m} g |\Delta y| = \frac{1}{2} \cancel{m} v_B^2$$

$$v_B = \sqrt{2g|\Delta y|}$$

$$= \sqrt{2(9{,}8)(0{,}146)}$$

$$v_B = 1{,}69 \, m/s \approx 1{,}7 \, m/s$$

(17) $W_{gesek} = f_k . d$

$$= (10)(5) = 50 \, J$$

$$W = F d$$

$$= 2(5) = 10 \, J$$

Dengan menerapkan ~~gu~~ usaha umum :

$$W = \Delta K + \Delta U + W_{gesek}$$

$W = \Delta K + \Delta U + W_{gesek}$

$10 = 35 + \Delta U + 50$

$\Delta U = -75\ J$

jadi Usaha oleh gaya gravitasi $= -\Delta U$

$= 75\ J$

(18) Dalam 1 detik, balok bergeser $d = 1{,}34\ m$

Ketinggian nya sejauh $h = d\sin\theta$

dimana $\theta = \tan^{-1}\left(\frac{30}{40}\right) = 37^\circ$

·) gaya gesek $= f_k = \mu_k\, mg\cos\theta$

$= 0{,}4\ (1400)\ (9{,}8)\ (0{,}8)$

$W = \Delta EM + W_{gesek}$

$= \Delta U + \Delta K + W_{gesek}$

$= mgh + f_k d$

$W = mg\, d\ (\sin\theta + \mu_k\cos\theta)$

$= 1{,}69 \times 10^4\ J$

$P = \frac{W}{t} = \frac{1{,}69 \times 10^4\ J}{1 s} = 1{,}69 \times 10^4\ W$

$P \approx 1{,}7 \times 10^4\ W$

(19) Koordinat titik tertinggi dari meriam,

$x = V_{0x} t$

$= V_0\cos\theta_0\, t$

$= \frac{V_0^2 \sin\theta_0 \cos\theta_0}{g}$

$= \frac{(20)^2}{9{,}8} \sin 60^\circ \cos 60^\circ$

$x = 17{,}7\ m$ dan,

$y = V_{0y} t - \frac{1}{2} g t^2$

$= \frac{1}{2} \frac{V_0^2 \sin^2\theta_0}{g} = \frac{(20)^2}{2(9{,}8)} \sin^2 60^\circ$

$y = 15{,}3 m$

Meriam meledak menjadi 2 bagian (di titik tertinggi)

$P_i = P_f$

$M V_0 \cos\theta_0 = \frac{M}{2} V_0 + 0$

$V_0 = 2 V_0 \cos\theta_0$

$= 2(20)\cos 60^\circ = 20\ m/s$

⊙ waktu total :

$X_{pm} = \frac{\cancel{m_1 x_1 + m_2 x_2}}{\cancel{m_{tot}}}$ $\quad t = \sqrt{\frac{2y_0}{g}}$

X partisi kedua : $X = x_0 + V_0 t$

$= 17{,}7 + 20\sqrt{\frac{2(15{,}3)}{9{,}8}}$

$x = 53\ m$

20.

$$I = \int F\, dt$$

$$= \int F_{dinding}\, dt$$

J = luas dibawah grafik $(F - t)$

$$J = \int F_{dinding}\, dt$$

$$m\vec{v}_f - m\vec{v}_i = \int_0^{0,002} F\,dt + \int_{0,002}^{0,004} F\,dt + \int_{0,004}^{0,006} F\,dt$$

$$m(+v) - m(-v) = \frac{1}{2} F_{max}(0{,}002) + F_{max}(0{,}002) + \frac{1}{2} F_{max}(0{,}002)$$

$$2mv = F_{max}(0{,}004)$$

$$2(0{,}058)(34) = F_{max}(0{,}004)$$

$$F_{max} = 9{,}9 \times 10^2 \text{ N}$$

21. Hukum kekekalan momentum :

$$P_i = P_f$$

$$m_1 v_1 = m_1 v_1' + m_2 v_2'$$

$$(0{,}01)(1000) = 5V + 0{,}01(400)$$

$$\vec{V} = 1{,}2 \text{ m/s}$$

© Dengan hukum kekekalan energi :

$$\Delta EM = 0$$

$$EM_i = EM_f$$

$$\frac{1}{2} m v^2 + 0 = mgh + 0$$

$$\frac{1}{2} \cancel{m} v^2 = \cancel{m} g h$$

$$\frac{1}{2}(1{,}2)^2 = 9{,}8\, h$$

$$h = 0{,}073 \text{ m.}$$

22.

$$P_i = P_f$$

$$m_1 v_1 = (m_1 + m_2) v$$

$$2(4) = (3) v$$

$$v = 2{,}7 \text{ m/s}$$

$$\Delta EM = 0$$

$$EM_i = EM_f$$

$$\frac{1}{2}(3)(2{,}7)^2 = \frac{1}{2}(200) x_m^2$$

$$X_m = 0{,}33 \text{ m}$$

24. Tinjau titik P dan h_1

$$\Delta EM = 0$$

$$EM_p = EM_{h_1}$$

$$\frac{1}{2} m v_p^2 + \frac{1}{2} I_{pm} \omega_p^2 = \frac{1}{2} m v^2 + \frac{1}{2} I_{pm} \omega^2 + mgh_1$$

$$\frac{gd^2}{2h} \quad \cancel{\frac{10gh}{7}} \quad v_p^2$$

V_p ~~= 1,34 m/s~~

Created by : wawan kurniawan

gerak jatuh :

$\cancel{V = V_{oy}}$

$$y = y_0 + V_{oy} t - \frac{1}{2} g t^2$$

$$0 = h_2 - \frac{1}{2} g t^2$$

$$t = \sqrt{\frac{2h_2}{g}}$$

$$x = V \cdot t$$

$$d = V \sqrt{\frac{2h_2}{g}}$$

$$V = \frac{d}{\sqrt{\frac{2h_2}{g}}}$$

$$V^2 = \frac{g d^2}{2h_2}$$

maka :

$$\frac{1}{2} m V_p^2 + \frac{1}{2}\left(\frac{2}{5} m r^2\right)\frac{V_p^2}{r^2} = \frac{1}{2} m V^2 + \frac{1}{2}\,\frac{2}{5} m r^2 \frac{V^2}{r^2} + m g h_1$$

$$\frac{1}{2} V_p^2 + \frac{1}{5} V_p^2 = \frac{1}{2} V^2 + \frac{1}{5} V^2 + g h_1$$

$$\frac{7}{10} V_p^2 = \frac{7}{10} V^2 + g h_1$$

$$\frac{7}{10} V_p^2 = \frac{7}{10}\left(\frac{g d^2}{2h_2}\right) + g h_1$$

$$V_p^2 = \frac{g d^2}{2h^2} + \frac{10}{7} g h_1$$

$$V_p = 1{,}34 \text{ m/s}$$

~~24~~ 23

- pusat massa benda paling atas, tidak lain di titik tengah :

$$a_1 = \frac{L}{2}$$

- $$x_{pm} = \frac{m(0) + m(-L/2)}{2m}$$

$$x_{pm} = -\frac{L}{4}$$

Jadi, $a_2 = \frac{L}{4}$

- $$x_{pm} = \frac{2m(0) + m\left(-\frac{L}{2}\right)}{3m} = -\frac{L}{6}$$

maka : $a_3 = \frac{L}{6}$

- $$x_{pm} = \frac{3m(0) + m\left(-\frac{L}{2}\right)}{4m}$$

$$= -\frac{L}{8}$$

Jadi, $a_4 = \frac{L}{8}$

Good luck for exam !!!

Semangat !!