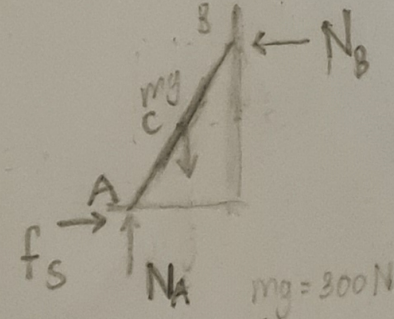
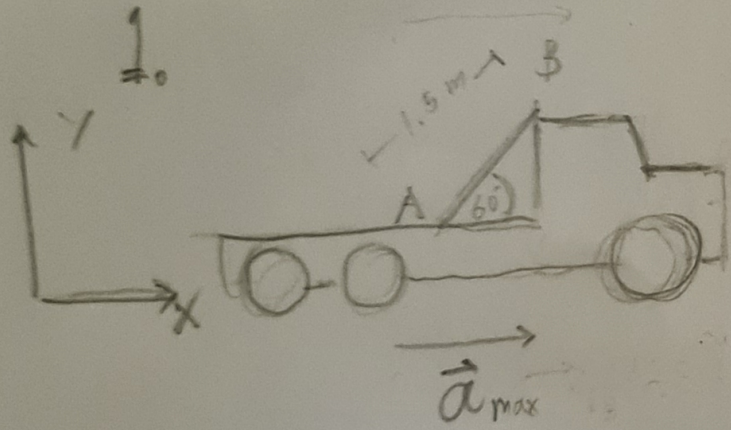


Problem 6210500757

FBD



* 1.5 m panel AB

$$\sum F_x = m \vec{a}_x$$

$$f_s - N_B = 30 \vec{a}_{max} \quad (1)$$

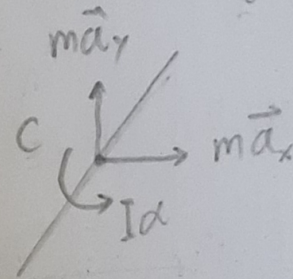
(1) + (2)

$$2f_s = 30 \vec{a}_{max} + 173.2$$

$$2\mu_s N_A = 30 \vec{a}_{max} + 173.2$$

$$\vec{a}_{max} = \frac{600\mu_s + 173.2}{30}$$

Kinetic Diagram



$$\sum \vec{a}_y = 0 \quad \vec{a}_x = \vec{a}_{max}$$

$$\alpha = 0$$

$$\therefore \sum F_y = 0$$

$$N_A = mg = 300 \text{ N}$$

$$\sum M_C = I \alpha$$

$$\sum M_C = 0$$

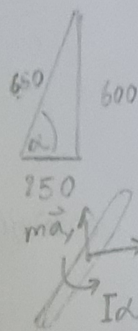
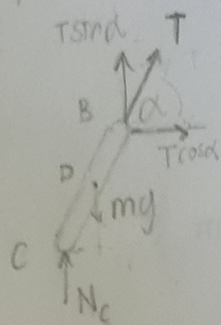
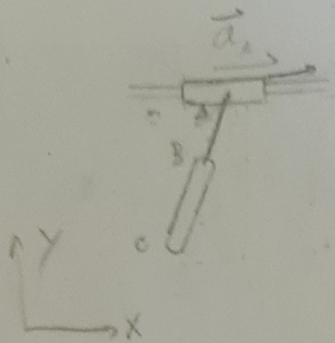
$$\left(\frac{1.5}{2} \sin 60^\circ\right) N_B + \left(\frac{1.5}{2} \sin 60^\circ\right) f_s - \left(\frac{1.5}{2} \cos 60^\circ\right) N_A = 0$$

$$0.65 (N_B + f_s) - (0.375)(300) = 0$$

$$N_B + f_s = \frac{112.5}{0.65} \approx 173.2 \quad (2)$$

$$\mu_s = 1 \quad \therefore \vec{a}_{max} = 14.2267 \text{ m/s}^2 \quad \mu_s = 1$$

2.



$$a_y = 0, \alpha = 0, \vec{a}_x = \vec{a}_A$$

$$\sum M_D = 0$$

$$N_c \left(\frac{400 \cos 50^\circ}{2} \right) = 0$$

$$\therefore N_c = 0$$

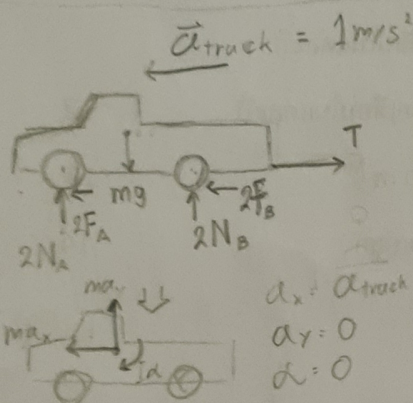
$$\therefore \sum F_y = 0$$

$$T \sin \alpha = mg$$

$$T = \frac{mg}{\sin \alpha} = 400 \times \frac{650}{600}$$

$$T = \frac{130}{3} \approx 43.33 \text{ N}$$

3

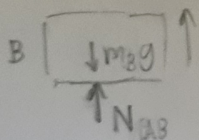


independent motion (non)

$$|a_{AB}| = 2|a_{truck}|$$

$$= 2 \text{ m/s}^2$$

$$a_B = 2 \text{ m/s}^2$$

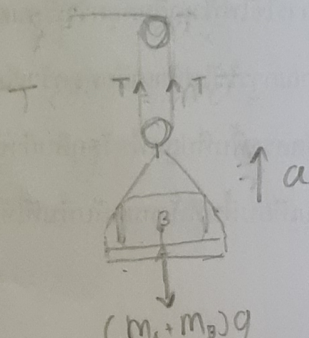


$$\sum F_y = m_B a_y$$

$$N_{AB} - m_B g = m_B a_y$$

$$N_{AB} = 400(10 + 2)$$

$$b.) N_{AB} = 4800 \text{ N}$$



independent A and B

$$\sum F_y = (m_A + m_B) \vec{a}_y$$

$$2T - (m_A + m_B)g = (m_A + m_B)a_{AB}$$

$$2T - (450)(10) = (450)(2)$$

$$2T = 5400$$

$$T = 2700 \text{ N}$$

$$\sum M_C = 0$$

$$(0.4)(2700) + (2)(2N_B) - (1.4)(2N_A) - 2F_A - 2F_B = 0$$

$$1080 + 4N_B - 2.8N_A - 2(F_A + F_B) = 0$$

$$1080 + 4N_B - 2.8N_A - 2(2350) = 0$$

$$4N_B - 2.8N_A = 3620$$

$$N_B - 0.7N_A = 905 \quad (3)$$

$$\sum F_x = m a_x$$

$$T \cos \alpha = m a_A$$

$$a_A = \frac{T}{m} \cos \alpha = \frac{130}{3(4)} \times \frac{250}{650}$$

$$a_A = \frac{125}{30} \approx 4.167 \text{ m/s}^2$$

independent truck

$$\sum F_y = 0$$

$$2(N_A + N_B) = mg$$

$$N_A + N_B = \frac{2000 \times 10}{2}$$

$$N_A + N_B = 10,000 \quad (1)$$

$$\sum F_x = m a_x$$

$$2(F_A + F_B) - T = m a_{truck}$$

$$F_A + F_B = \frac{2000(1) + 2700}{2}$$

$$F_A + F_B = 2350 \quad (2)$$

independent $F_A + F_B$ and (2)

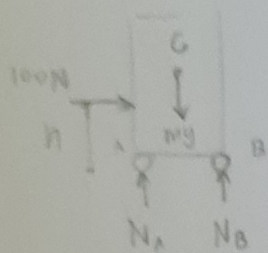
independent (1) and (3)

$$N_A + N_B - N_B + 0.7N_A = 10,000 - 905$$

$$1.7N_A = 9095$$

$$d.) N_A = 5350 \text{ N}$$

4.



$$\Sigma F_x = m a_x$$

$$100 = 20 a_x$$

$$a_x = 5 \text{ m/s}^2$$

$$\Sigma F_y = 0$$

$$N_A + N_B = 200$$

b. range of h
 $= [0.3, 1.5] \text{ m}$

$h_{\min}$ is when N_A is zero / N_B is zero

$$h_{\min} = \frac{0.3(0-200) + 90}{100}$$

$$h_{\min} = 0.3 \text{ m}$$

b.) $\gamma_{\text{axis}} \rightarrow \alpha = 0$

$$\Sigma M_O = 0$$

$$(0.9-h)(100) + (0.3 N_B - 0.3 N_A) = 0$$

$$90 - 100h + 0.3 N_B - 0.3 N_A = 0$$

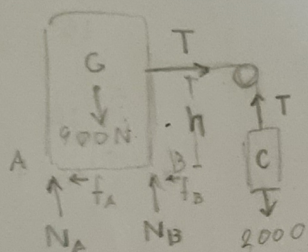
$$h = \frac{0.3(N_B - N_A) + 90}{100}$$

$h_{\max}$ is when N_B is zero / N_A is zero

$$h_{\max} = \frac{0.3(200-0) + 90}{100}$$

$$h_{\max} = 1.5 \text{ m}$$

5.



$$\Sigma F_y = 0$$

$$N_A + N_B = 900$$

in dependent motion

$$\ddot{a}_c = \ddot{a}_o$$

$$\Sigma F_y = m_c \ddot{a}_y$$

$$2000 - T = 200 \ddot{a}_c$$

$$\ddot{a}_c = \frac{2000 - T}{200}$$

$$\Sigma F_x = m_c \ddot{a}_x$$

$$T - f_A - f_B = 900 \ddot{a}_o$$

$$T - \mu_k(N_A + N_B) = 900 \ddot{a}_o$$

$$\ddot{a}_o = \frac{T - 0.35(900)}{90}$$

$$\therefore \frac{2000 - T}{200} = \frac{T - 315}{90}$$

$$18000 - 9T = 20T - 6300$$

$$29T = 24300$$

$$T \approx 837.93 \text{ N}$$

$\gamma_{\text{axis}} \alpha = 0$

$$\Sigma M_O = 0$$

$$250 N_B - 250 N_A - 450(f_A + f_B)$$

$$-(h-450)T = 0$$

$$250(N_B - N_A) - 141750 - Th + 450T = 0$$

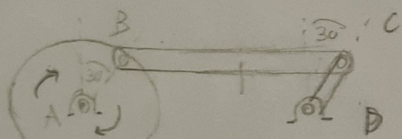
$$h = \frac{250(N_B - N_A) - 141750 + 450T}{29}$$

$h_{\max}$ (is when N_B is zero / N_A is zero)

$$h_{\max} = \frac{250(900-0) - 141750 + 450 \frac{24300}{29}}{29}$$

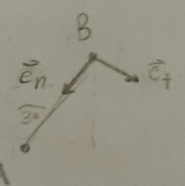
$$h_{\max} \approx 549.35 \text{ mm}$$

6.



$$\omega = 120 \text{ rpm}$$

$$\omega = 6\pi \text{ rad/s}$$



$$\vec{a}_B = \omega^2 r \vec{e}_n + \alpha \vec{e}_t$$

$$\vec{a}_B = (6\pi^2(0.2))$$

$$= 7.2\pi^2 \text{ m/s}^2$$

(is when) $\alpha = 0$

$$\ddot{a}_x = 7.2\pi^2 \sin 30^\circ$$

$$\ddot{a}_y = 7.2\pi^2 \cos 30^\circ$$

translation

translation

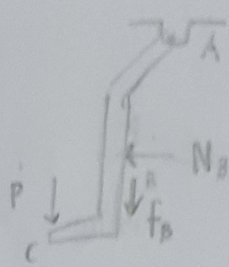
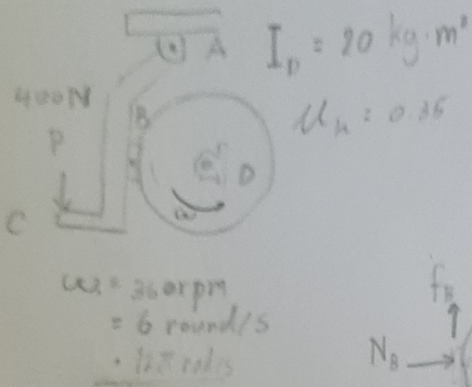
$$\Sigma F_y = m \ddot{a}_y$$

$$F_{By} + F_{Cy} + mg = m \ddot{a}_y$$

$$F_{By} + F_{Cy} = m(\ddot{a}_y - g)$$

$$= 7.5(7.2\pi^2 \cos 30^\circ - 10) \approx 386.56 \text{ N}$$

7.



$$\Sigma M_A = 0$$

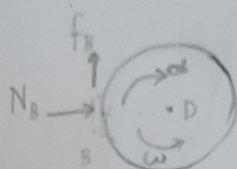
$$P(150) + f_B(50) - N_B(250) = 0$$

$$P(150) + \mu_k N_B(50) - N_B(250) = 0$$

$$400(250) + (0.35 \times 50) N_B - N_B(250) = 0$$

$$(150 - 17.5) N_B = 100,000$$

$$N_B = 430.11 \text{ N}$$



$$\Sigma M_D = I \alpha$$

$$-(0.35 \times 430.11) = 20 \alpha$$

$$\alpha = -\frac{(0.35)(430.11)}{20}$$

$$\alpha = -7.53 \text{ rad/s}^2$$

$$\omega^2 = \omega^2 + 2 \theta \alpha$$

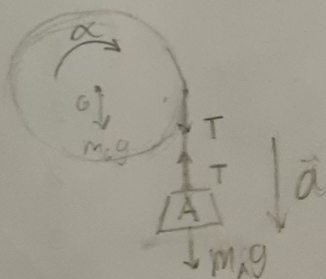
$$0^2 = (12\pi)^2 + 2 \theta (-7.53)$$

$$\theta = \frac{(12\pi)^2}{2(7.53)} \approx 94.37 \text{ rad}$$

$$\approx 15 \text{ round}$$

∴ ကိန်းအရေအတွက် 15 ရှိသည်။

8.



flywheel

$$\Sigma M_G = I \alpha$$

$$Tr = m_G r \alpha$$

$$0.5 T = (120)(0.375) \alpha$$

$$T = 90 \alpha \quad (1)$$

$$(1) = (2)$$

$$90 \alpha = 150 - 7.5 \alpha$$

$$97.5 \alpha = 150$$

$$\alpha = 1.54 \text{ rad/s}$$

flywheel

$$\Sigma F_y = m a_y$$

$$m a g - T = m_A a \quad \text{and } a = r \alpha$$

$$T = m_A (g - r \alpha)$$

$$T = 15(10 - 0.5 \alpha) \quad (2)$$

$$\text{and } a = r \alpha$$

$$a = (0.5)(1.54)$$

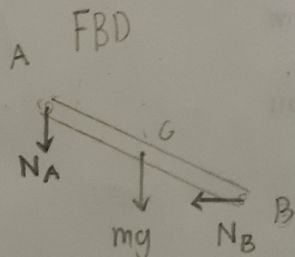
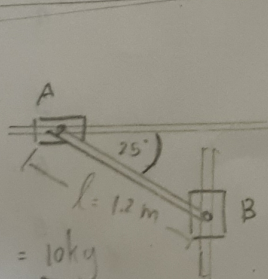
$$a) \alpha \approx 0.77 \text{ m/s}^2$$

$$V^2 = u^2 + 2 s a$$

$$V^2 = 0^2 + 2(1.5)(0.77)$$

$$b.) V = \sqrt{2.31} \approx 1.52 \text{ m/s}$$

9.



$$\text{and } \vec{a}_A = \vec{a}_B + \vec{a}_{A/B} \quad \text{and } a_B = g \text{ (vertical direction)}$$

∴

$$\vec{a}_B = a_{A/B} \cos 25^\circ$$

$$10 = \alpha l \cos 25^\circ$$

$$\alpha = \frac{10}{1.2 \cos 25^\circ} \approx 9.19 \text{ rad/s}$$

$$\text{and FBD } \Sigma M_G = I \alpha$$

$$N_A(0.6 \cos 25^\circ) - N_B(0.6 \sin 25^\circ) = \frac{1}{12} m l^2 \alpha$$

$$N_A(0.544) - N_B(0.254) = 11.034$$

$$\Sigma F_y = m \vec{a}_y$$

$$N_A + mg = m \vec{a}_y$$

$$N_A = 10(5 - 10) = -50 \text{ N}$$

$$\therefore N_B = \frac{N_A(0.544) - 11.034}{0.254}$$

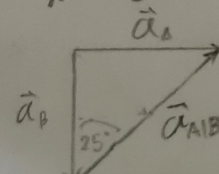
$$\approx -150.74 \text{ N}$$

GPM

$$\vec{a}_{A/B} = \frac{v^2}{l} \vec{e}_n + \alpha l \vec{e}_t$$

$$= 0 \vec{e}_n + \alpha l \vec{e}_t$$

$$\vec{a}_A = \vec{a}_B + \vec{a}_{A/B}$$



$$\vec{a}_G = \vec{a}_B + \vec{a}_{G/B}$$