Assignment 1

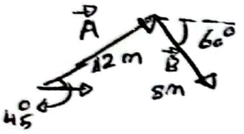
1. $d_1 = 40km \quad s_1 = 80km/h$

$d_2 = 40km \quad s_2 = 40km/h$

$$\bar{s} = \frac{d_1+d_2}{t_1+t_2} = \frac{d_1+d_2}{\frac{d_1}{s_1}+\frac{d_2}{s_2}} = \frac{80}{\frac{3}{2}} = 53km/h$$

2. $\vec{c} = \vec{a} - \vec{b} \rightarrow \vec{b} + \vec{c} = \vec{a}$

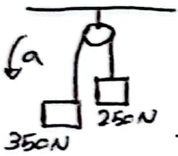
3. $(\vec{A}+\vec{B})_x = A_x + B_x = 12,5\ m$



$\rightarrow A_x = 12 * \cos 45°\ m$

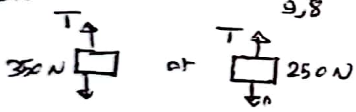
$B_x = 8 * \cos 60°\ m$

4.



$\rightarrow \Sigma F_{on\ system} = ma$

$350 - 250 = \frac{350+250}{9,8} a \rightarrow a = 1,633$



$\Sigma F = ma$

$350 - T = \frac{350}{9,8} * 1,633$

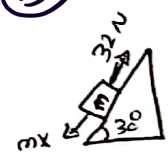
$\rightarrow T = 290\ N$

$\Sigma F = ma$

$T = mg + ma$

$= 290N$

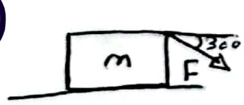
5.



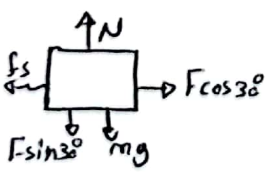
$\rightarrow \Sigma F_x = m\underbrace{a_x}_{0} = 32 - mg\sin 30° = 0$

$\rightarrow m = 6,5\ kg$

6.



$\rightarrow$



$\Sigma F_x = m\underbrace{a_x}_{0} = F\cos 30° - f_s = 0 \rightarrow F\cos 30° - \mu_s N = 0$

$\Sigma F_y = m\underbrace{a_y}_{0} = N - mg - F\sin 30° = 0 \rightarrow N = mg + F\sin 30°$

$\rightarrow F\cos 30° - \mu_s(mg + F\sin 30°) = 0$

$$\rightarrow F = \frac{\mu_s mg}{\cos 30° - \mu_s \sin 30°} = 71\ N$$

7.

$\rightarrow mg\sin\alpha = 20,7\ N$

$f_f \rightarrow f_{s\,max} = \mu_s N = \mu_s mg\cos\alpha$

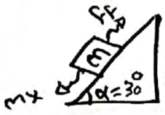
$= 22,2\ N$

$\rightarrow f_{s\,max} > mg\sin\alpha \rightarrow f_{friction} = mg\sin\alpha$

$= 20,7\ N$

Assignment 1

(8)

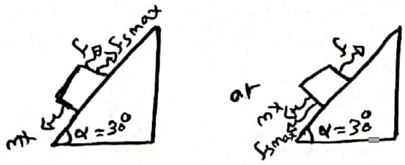


$\to mx = mg\sin\alpha = 24{,}5\ N$

$f_f \to f_{s\,max} = \mu_s N = \mu_s\, mg\cos\alpha$

$\Sigma F_y = 0 \to mg\cos\alpha = N$

ظبطالقانون Σ $\longrightarrow$



$f_{s\,max} = 21{,}2\ N \quad \to mx > f_{s\,max}$ then the object will move

$\to f_f = f_k = \dfrac{f_{s\,max}}{\mu_s} \times \mu_k = 16{,}97 = 17\ N$

(9)

$\Sigma F_x = 0 \to mx - f_{s\,max} = F$

$\to F = 3{,}4\ N$

(10)

$\Sigma F_x = 0 \to F = mx + f_{s\,max}$

$\to F = 45{,}6\ N$

(12)

$\to$ when A, B move as one block

$\to$ same a

f_s $\boxed{B}$ $\to \Sigma F_{on\,B} = m_B a \to f_{s\,B} = m_B a$

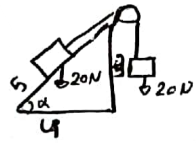
$\to \mu_s m_B g = a\, m_B \to a = \mu_s g$

$\to \Sigma F_{on\ system} = ma$

$F = \mu_s g(m_A + m_B) \to F > \mu_s g(m_A + m_B) \to a > \mu_s g$

$\to$ A, B will seperate

(13)



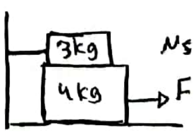
$\to \Sigma F_{on\,system} = m\underset{\to 0}{a} \to 20 = 20\sin\alpha + f_s$

$\to \Sigma F_{on\ m} = 0 \to N = mg\cos\alpha$

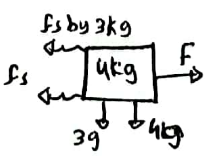
$\to \mu_s\, mg\cos\alpha = 20 - 20 \times \frac{3}{5} = 8\ N$

$F_{net} = m\underset{\to = 0}{a} \to F_{net} = 0$

(14)



$\mu_s = ,8$ for all surfaces



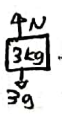
$\to$ 4kg start to move if $\Sigma F = 0 \to F = f_s + f_{s\ by\ 3kg}$

$F = \mu_s N + \mu_s N_{of\ 3kg}$

$F = \mu_s 7g + \mu_s 3g$

$= \mu_s 10g = 78{,}4$

$\Sigma F_y = 0 \to N = 7g$



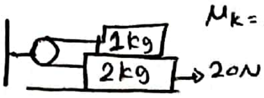
$\to \Sigma F_y = 0$

$N = 3g$

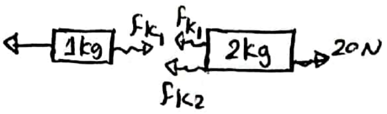
Assignment 1

سؤال محترم

15



$\mu_k = 0.16$ for all surfaces

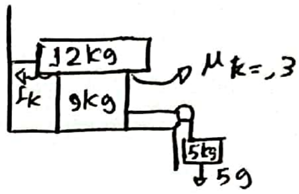


$\rightarrow \Sigma F_{on\ system} = ma$

$20 - f_{k_2} - 2f_{k_1} = 3a \rightarrow 20 - \mu_k(3g - 2*g) = 3a$

$\rightarrow a = 4.1\ m/s^2$

16

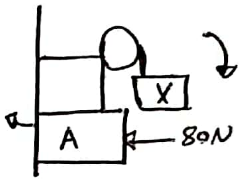


$\mu_k = 0.3$

$\Sigma F_{on\ 9kg-5kg\ system} = ma$

$5g - \underbrace{f_k}_{\mu_k(12g)} = 14a \rightarrow a = 1\ m/s^2$

18



$a = 1.6\ m/s^2$

$\mu_k = 0.3$

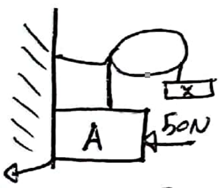
$A = 5kg$

$\rightarrow \Sigma F_{on\ system} = ma$

$xg - Ag - f_k = (x+5)1.6$

$x = \frac{8 + 5g + 0.3*80}{g - 1.6} = 9.9\ kg$

19



$a = 0$

$A = 8kg$

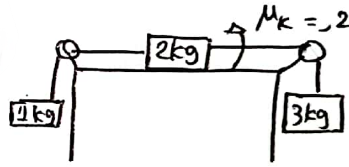
$\mu_k = 0.3$

$\Sigma F_{on\ system} = 0$

$\rightarrow xg + f_k = Ag \rightarrow xg = Ag - f_k$

$x = 6.5\ kg$

20



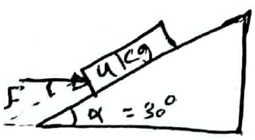
$\mu_k = 0.25$

$\Sigma F_{on\ system} = ma$

$3g - g - f_{k_{2kg}} = 6a$

$2g - \mu_k 2g = 6a \rightarrow a = 2.5\ m/s^2$

21



$\rightarrow \Sigma F_y = 0 \rightarrow N = mg\cos\alpha + F\sin\alpha$

$\Sigma F_x = 0 \rightarrow F\cos\alpha = f_s + mg\sin\alpha$

$\rightarrow F\cos\alpha = \mu_s(mg\cos\alpha + F\sin\alpha) + mg\sin\alpha$

$\rightarrow F = \frac{mg(\sin\alpha + \mu_s\cos\alpha)}{\cos\alpha - \mu_s\sin\alpha} = 84N$