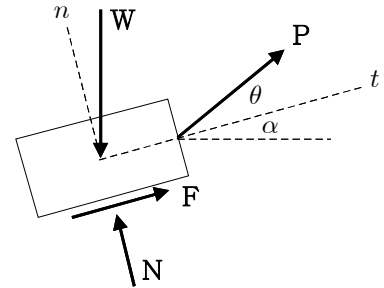


[8.1~8.2절]

8.3 $\theta = 20^\circ, \alpha = 20^\circ, m = 10 \text{ kg}, P = 40 \text{ N}, \mu_s = 0.30, \mu_k = 0.25$
 $W = mg = (10 \text{ kg})(9.81 \text{ m/s}^2) = 98.1 \text{ N}$

$$\begin{aligned} \curvearrowright \Sigma F_n &= 0; N - W \cos\alpha + P \sin\theta = 0 \\ \Rightarrow N &= W \cos\alpha - P \sin\theta \\ &= (98.1 \text{ N}) \cos 20^\circ - (40 \text{ N}) \sin 20^\circ = 78.50 \text{ N} \\ F_{\max} &= \mu_s N = (0.30)(78.50 \text{ N}) = 23.55 \text{ N} \end{aligned}$$



1) 마찰력이 오른쪽 위 방향이라면

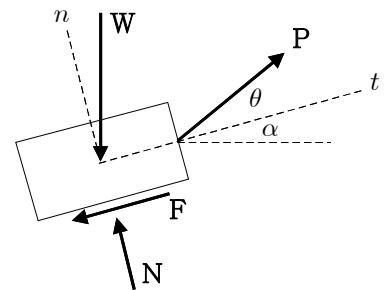
$$\begin{aligned} \nearrow \Sigma F_t &= 0; F - W \sin\alpha + P \cos\theta = 0 \\ \Rightarrow F &= W \sin\alpha - P \cos\theta = (98.1 \text{ N}) \sin 20^\circ - (40 \text{ N}) \cos 20^\circ = -4.035 \text{ N} < 0 \end{aligned}$$

마찰력 F 가 음수인 것은 마찰력 방향이 맞지 않다는 의미임.

2) 마찰력이 왼쪽 아래 방향

$$\begin{aligned} \nearrow \Sigma F_t &= 0; -F - W \sin\alpha + P \cos\theta = 0 \\ \Rightarrow F &= -W \sin\alpha + P \cos\theta \\ &= -(98.1 \text{ N}) \sin 20^\circ + (40 \text{ N}) \cos 20^\circ \\ &= 4.035 \text{ N} \end{aligned}$$

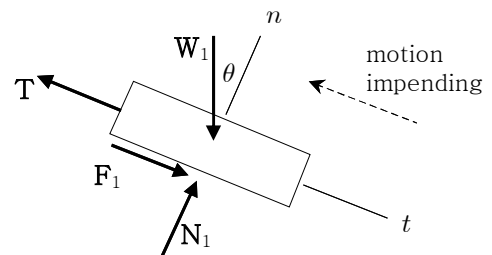
$F < F_{\max}$ 이므로 평형(equilibrium)상태임.
 $\mathbf{F} = 4.04 \text{ N} \swarrow 20^\circ$



8.11 $W_1 = 20 \text{ N}, W_2 = 30 \text{ N}, \mu_s = 0.15$

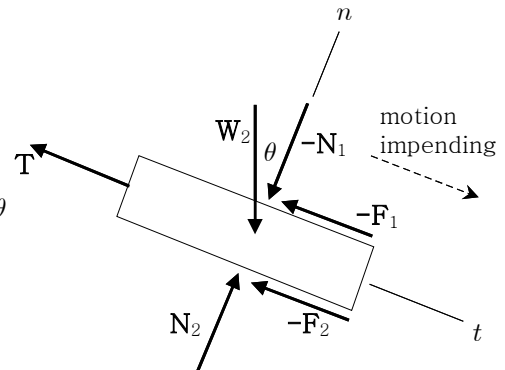
블록 A

$$\begin{aligned} \nearrow \Sigma F_n &= 0; N_1 - W_1 \cos\theta = 0 \\ \Rightarrow N_1 &= W_1 \cos\theta \\ F_1 &= \mu_s N_1 = \mu_s W_1 \cos\theta \\ \curvearrowright \Sigma F_t &= 0; T - W_1 \sin\theta - F_1 = 0 \\ \Rightarrow T &= W_1 \sin\theta + \mu_s W_1 \cos\theta \end{aligned}$$



블록 B

$$\begin{aligned} \curvearrowright \Sigma F_t &= 0; T + F_1 - W_2 \sin\theta = 0 \\ \Rightarrow T &= W_2 \sin\theta - \mu_s W_1 \cos\theta \end{aligned}$$



$$\begin{aligned} W_1 \sin\theta + \mu_s W_1 \cos\theta &= W_2 \sin\theta - \mu_s W_1 \cos\theta \\ \Rightarrow (W_2 - W_1) \sin\theta &= 2 \mu_s W_1 \cos\theta \\ \Rightarrow \tan\theta &= \frac{2 \mu_s W_1}{W_2 - W_1} = \frac{2(0.15)(20 \text{ N})}{(30 \text{ N}) - (20 \text{ N})} = 0.6 \\ \Rightarrow \theta &= \tan^{-1}(0.6) = 30.96^\circ \Rightarrow \theta = 31.0^\circ \end{aligned}$$

8.20 $W = 100 \text{ N}, \quad \mu_s = 0.40, \quad \mu_k = 0.30$

$a = 0.075 \text{ m}, \quad b = 0.150 \text{ m}$

$F_B = 0$

운동마찰 (돌고 있으므로) $F_A = \mu_k N_A,$

$$\begin{aligned} \rightarrow \Sigma F_x = 0 ; \quad F_A - N_B &= 0 \\ \Rightarrow N_B &= F_A = \mu_k N_A \end{aligned}$$

$$\begin{aligned} \uparrow \Sigma F_y = 0 ; \quad P + N_A - W &= 0 \\ \Rightarrow N_A &= W - P \end{aligned}$$

$$\begin{aligned} \curvearrowleft \Sigma M_G = 0 ; \quad a P - b F_A &= 0 \\ \Rightarrow P &= \frac{b}{a} F_A = \frac{b}{a} \mu_k N_A = \frac{b}{a} \mu_k (W - P) \\ \Rightarrow (a + b \mu_k) P &= b \mu_k W \\ \Rightarrow P &= \frac{b \mu_k}{a + b \mu_k} W \\ &= \frac{(0.150 \text{ m}) 0.30}{(0.075 \text{ m}) + (0.150 \text{ m}) 0.30} (100 \text{ N}) = 37.5 \text{ N} \end{aligned}$$

