

<8.3~8.4절>

8.7  $W = 80 \text{ N}, \quad \mu_s = 0.25, \quad \mu_k = 0.20$

$\theta = 30^\circ$

$\phi_k = \tan^{-1}(0.20) = 11.31^\circ$

(a) 오른쪽으로 이동

$\alpha = 90^\circ + \theta = 90^\circ + 30^\circ = 120^\circ$

$\beta = 180^\circ - \alpha - \phi_k = 180^\circ - 120^\circ - 11.31^\circ = 48.69^\circ$

블록에서

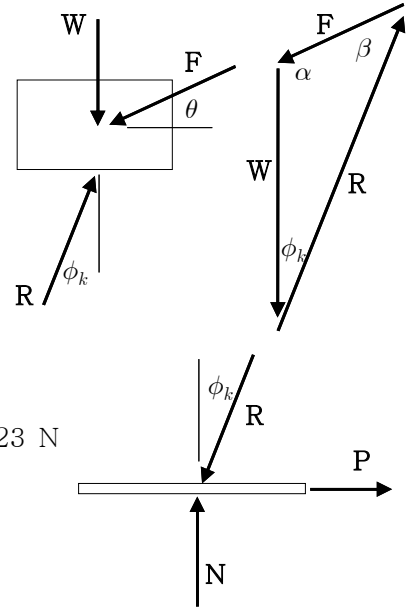
$$\frac{R}{\sin \alpha} = \frac{W}{\sin \beta}$$

$$\Rightarrow R = W \frac{\sin \alpha}{\sin \beta} = (80 \text{ N}) \frac{\sin 120^\circ}{\sin 48.69^\circ} = 92.23 \text{ N}$$

벨트에서

$$\rightarrow \Sigma F_x = 0; \quad P - R \sin \phi_k = 0$$

$$\Rightarrow P = R \sin \phi_k = (92.23 \text{ N}) \sin 11.31^\circ = 18.09 \text{ N}$$



(b) 왼쪽으로 이동

$\gamma = 90^\circ - \theta = 90^\circ - 30^\circ = 60^\circ$

$\psi = 180^\circ - \gamma - \phi_k = 180^\circ - 60^\circ - 11.31^\circ = 108.69^\circ$

블록에서

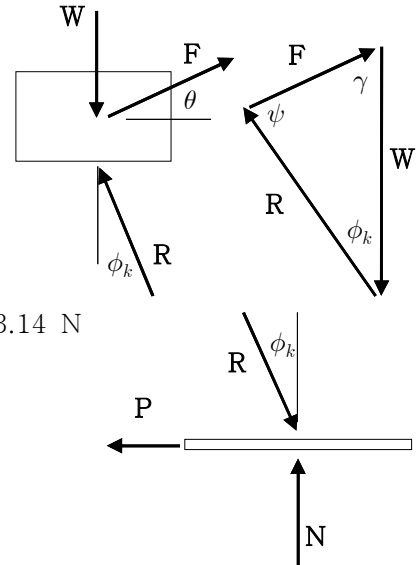
$$\frac{R}{\sin \gamma} = \frac{W}{\sin \psi}$$

$$\Rightarrow R = W \frac{\sin \gamma}{\sin \psi} = (80 \text{ N}) \frac{\sin 60^\circ}{\sin 108.69^\circ} = 73.14 \text{ N}$$

벨트에서

$$\rightarrow \Sigma F_x = 0; \quad -P + R \sin \phi_k = 0$$

$$\Rightarrow P = R \sin \phi_k = (73.14 \text{ N}) \sin 11.31^\circ = 14.34 \text{ N}$$



8.23  $\mu_s = 0.15, \quad \theta = 30^\circ$

$$\uparrow \Sigma M_B = 0 ; \quad P (L \sin \theta) - N \left( \frac{a}{\sin \theta} \right) = 0$$

$$\Rightarrow \quad \frac{a}{L} = \frac{P}{N} \sin^2 \theta$$

(i) 물러가 올라가려 할 때,  $F = \mu_s N$

$$\uparrow \Sigma F_y = 0 ; \quad N \sin \theta - F \cos \theta - P = 0$$

$$\Rightarrow \quad P = N \sin \theta - \mu_s N \cos \theta$$

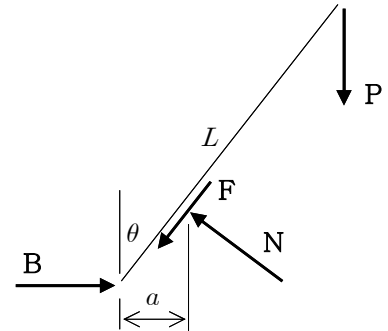
$$= N (\sin \theta - \mu_s \cos \theta)$$

$$\Rightarrow \quad \frac{P}{N} = \sin \theta - \mu_s \cos \theta$$

$$\frac{a}{L} = (\sin \theta - \mu_s \cos \theta) \sin^2 \theta$$

$$= [\sin 30^\circ - (0.15) \cos 30^\circ] \sin^2 30^\circ = 0.09252$$

$$\frac{L}{a} = \frac{1}{0.09252} = 10.81$$



(ii) 물러가 내려가려 할 때,  $F = \mu_s N$

$$\uparrow \Sigma F_y = 0 ; \quad N \sin \theta + F \cos \theta - P = 0$$

$$\Rightarrow \quad P = N \sin \theta + \mu_s N \cos \theta$$

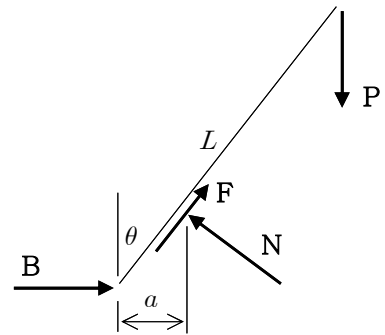
$$= N (\sin \theta + \mu_s \cos \theta)$$

$$\Rightarrow \quad \frac{P}{N} = \sin \theta + \mu_s \cos \theta$$

$$\frac{a}{L} = (\sin \theta + \mu_s \cos \theta) \sin^2 \theta$$

$$= [\sin 30^\circ + (0.15) \cos 30^\circ] \sin^2 30^\circ = 0.1575$$

$$\frac{L}{a} = \frac{1}{0.1575} = 6.35$$



$$\Rightarrow \quad 6.35 \leq \frac{L}{a} \leq 10.81$$