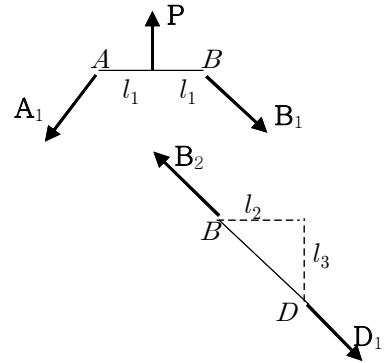


{8.1절}

8.32 $P = 500 \text{ N}$, $l_1 = 45 \text{ mm}$, $l_2 = 90 \text{ mm}$, $l_3 = 75 \text{ mm}$,
 $l_4 = 105 \text{ mm}$, $l_5 = 360 \text{ mm}$, $l_6 = 157.5 \text{ mm}$

S; two-force body의 힘의 방향

M;



A; 링크 AB에서,

$$B_{1y} = \frac{1}{2} P = \frac{1}{2} (500 \text{ N}) = 250 \text{ N}$$

연결점 B에서,

$$B_2 = B_1 \Rightarrow B_{2y} = B_{1y} = 250 \text{ N}$$

링크 BD에서, 2力 부재(two-force body)

$$\frac{B_{2y}}{B_{2x}} = \frac{l_3}{l_2} \Rightarrow B_{2x} = \frac{l_2}{l_3} B_{2y} = \frac{90}{75} (250 \text{ N}) = 300 \text{ N}$$

$$D_{1x} = B_{2x} = 300 \text{ N}, \quad D_{1y} = B_{2y} = 250 \text{ N}$$

연결점 D에서,

$$D_2 = D_1$$

$$\Rightarrow D_{2x} = D_{1x} = 300 \text{ N}, \quad D_{2y} = D_{1y} = 250 \text{ N}$$

링크 DEF에서,

$$F_y = \frac{1}{2} (500 \text{ N}) = 250 \text{ N},$$

$$\Sigma M_E = 0 ;$$

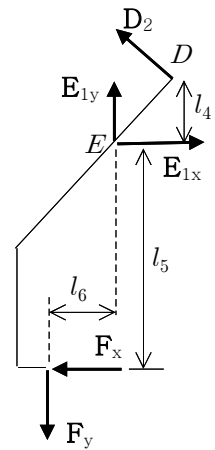
$$-l_5 F_x + l_6 F_y + l_4 D_{2x} + (l_1 + l_2) D_{2y} = 0$$

$$\Rightarrow F_x = \frac{l_6 F_y + l_4 D_{2x} + (l_1 + l_2) D_{2y}}{l_5}$$

$$= \frac{(157.5 \text{ mm}) (250 \text{ N}) + (105 \text{ mm}) (300 \text{ N}) + (45 + 90 \text{ mm}) (250 \text{ N})}{360 \text{ mm}}$$

$$= 290.6 \text{ N}$$

$$F_y = \mu_s F_x \Rightarrow \mu_s = \frac{F_y}{F_x} = \frac{250 \text{ N}}{290.6 \text{ N}} = 0.860$$



R; (과정의 타당성 검토) (가령, 다른 평형방정식을 선택하면?)

T; (결과의 의미 검토) (가령, 마찰계수 0.860의 의미, 블록이 미끄러진다면?)

8.7 $\mu_s = 0.30, \mu_k = 0.25, m = 10 \text{ kg}, \theta = 35^\circ$
 $W = (10 \text{ kg})(9.806 \text{ m/s}^2) = 98.06 \text{ N}$

S; 마찰각 $\phi_k = \tan^{-1}(0.25) = 14.04^\circ$
 블록과 벨트에서 각각 힘 삼각형

(a) A;

블록에서 (힘 삼각형)

$$\alpha = 90^\circ - \theta - \phi_k$$

$$= 90^\circ - 35^\circ - 14.04^\circ = 41.0^\circ$$

$$\beta = 90^\circ + \theta = 90^\circ + 35^\circ = 125^\circ$$

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

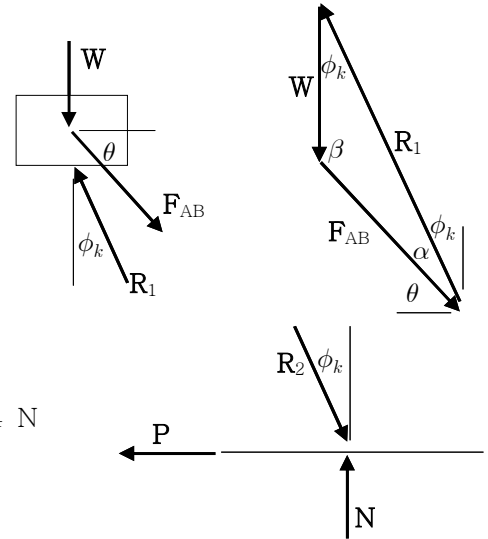
$$\Rightarrow R = \frac{\sin\beta}{\sin\alpha} W = \frac{\sin 125^\circ}{\sin 41.0^\circ} (98.06 \text{ N}) = 122.4 \text{ N}$$

벨트에서

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

$$\Rightarrow P = R \sin\phi_k = (122.4 \text{ N}) \sin 14.04^\circ = 29.69 \text{ N} \Rightarrow P = 29.7 \text{ N} \leftarrow$$

M;



(b) A;

블록에서 (힘 삼각형)

$$\alpha = 90^\circ - \theta = 90^\circ - 35^\circ = 55^\circ$$

$$\beta = 180^\circ - \alpha - \phi_k$$

$$= 180^\circ - 55^\circ - 14.04^\circ = 110.96^\circ$$

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

$$\Rightarrow R = \frac{\sin\alpha}{\sin\beta} W = \frac{\sin 55^\circ}{\sin 110.96^\circ} (98.06 \text{ N}) = 86.02 \text{ N}$$

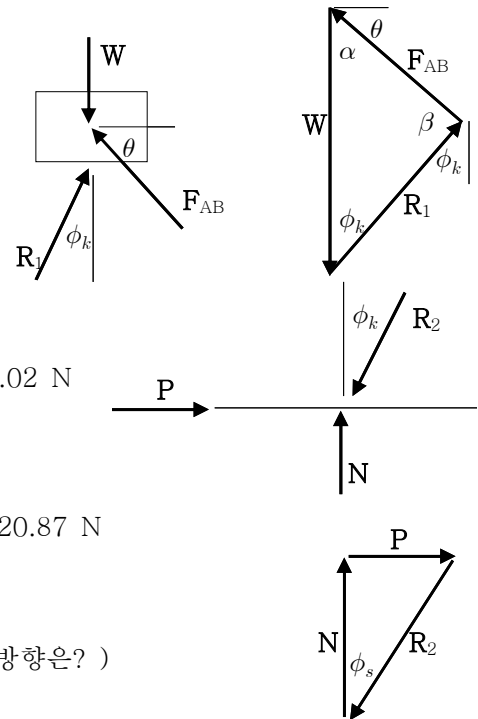
벨트에서

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

$$\Rightarrow P = R \sin\phi_k = (86.02 \text{ N}) \sin 14.04^\circ = 20.87 \text{ N}$$

$$\Rightarrow P = 20.9 \text{ N} \rightarrow$$

M;



R; (과정의 타당성 검토) (가령, 링크 AB가 가하는 힘의 방향은?)

T; (결과의 의미 검토) (가령, 힘 P에 따른 마찰력의 방향은?)