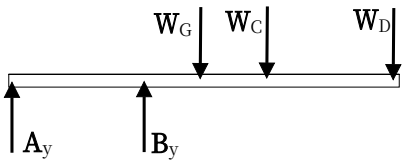
정 역 학　　연습문제 풀이　　제4장

<4.1~4.5절>

4.2　$W_G = m_G g$ = (65 kg)(9.81 m/s^2) = 637.65 N

$W_C = m_C g$ = (28 kg)(9.81 m/s^2) = 274.68 N

$W_D = m_D g$ = (40 kg)(9.81 m/s^2) = 392.4 N



(a) $\circlearrowleft \Sigma M_B = 0$;

$-A_y$ (1.2 m) - W_G (0.48 m) - W_C (1.08 m) - W_D (2.08 m) = 0

$\Rightarrow A_y = -\frac{1}{1.2}[(637.65\text{ N})(0.48) + (274.68\text{ N})(1.08) + (392.4\text{ N})(2.08)] = -1182.4$ N

$\Rightarrow$ $\mathbf{A}_y$ = 1.182 kN ↓

(a) $\circlearrowleft \Sigma M_A = 0$;

B_y (1.2 m) - W_G (1.68 m) - W_C (2.28 m) - W_D (3.28 m) = 0

$\Rightarrow B_y = \frac{1}{1.2}[(637.65\text{ N})(1.68) + (274.68\text{ N})(2.28) + (392.4\text{ N})(3.28)] = 2487.2$ N

$\Rightarrow$ $\mathbf{B}_y$ = 2.49 kN ↑

(검산) $\uparrow \Sigma F_y = 0$;

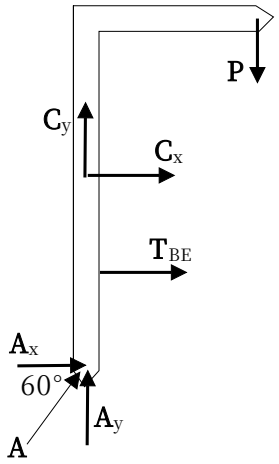
$A_y + B_y - W_G - W_C - W_D = (-1182.4) + 2487.2 - 637.65 - 274.68 - 392.4$

$= 0.07 \approx 0$

4.15　T_{BE} = 14 N,　P = 21 N

$A_x = A\cos 60° = (0.5)\,A$

$A_y = A\sin 60° = (0.866)\,A$



(a) $\circlearrowleft \Sigma M_C = 0$;

$(0.5)A$ (0.04 m) + T_{BE} (0.02 m) - P (0.04 m) = 0

$\Rightarrow A = \frac{1}{(0.5)(0.04)}[-(14\text{ N})(0.02) + (21\text{ N})(0.04)]$

= 28.0 N

$\Rightarrow$ $\mathbf{A}$ = 28.0 N ∠60°

(b) $\rightarrow \Sigma F_x = 0$;

$C_x + A_x + T_{BE} = 0$

$\Rightarrow$ $C_x = -A_x - T_{BE} = -0.5\,(28\text{ N}) - (14\text{ N}) = -28.0$ N $\Rightarrow$ $\mathbf{C}_x$ = 28.0 N ←

$\uparrow \Sigma F_y = 0$;

$C_y + A_y - P = 0$

$\Rightarrow$ $C_y = -A_y + P = -0.866\,(28\text{ N}) + (21\text{ N}) = -3.248$ N $\Rightarrow$ $\mathbf{C}_y$ = 3.25 N ↓

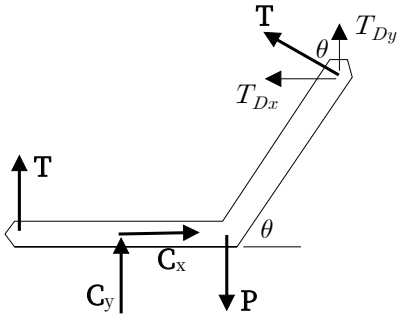
$C = \sqrt{C_x^2 + C_y^2} = \sqrt{(-28.0\ \text{N})^2 + (-3.248\ \text{N})^2} = 28.19\ \text{N}$

$\tan\theta = \dfrac{C_y}{C_x} = \dfrac{-3.248}{-28.0} = 0.1160 \quad \Rightarrow \quad \theta = \tan^{-1}0.1160 = 6.62°$

$\Rightarrow \quad \mathbf{C} = 28.2\ \text{N} \measuredangle 6.62°$

4.35 $\theta = 60°$

$T_{Dx} = T\sin\theta, \quad T_{Dy} = T\cos\theta$



$\circlearrowleft \Sigma M_C = 0$;

$-T\,a - P\,a + (T\sin\theta)(2a\sin\theta)$

$+ (T\cos\theta)(a + 2a\cos\theta) = 0$

$\Rightarrow \quad -T\,a + 2\,T\,a\sin^2\theta$

$+ T\,a\cos\theta + 2\,T\,a\cos^2\theta = P\,a$

$\Rightarrow \quad -T + 2\,T + T\cos\theta = P$

$\Rightarrow \quad T + T\cos\theta = P$

$\Rightarrow \quad T = \dfrac{P}{1+\cos\theta} = \dfrac{P}{1+\cos 60°} = \dfrac{P}{1.5} = \dfrac{2}{3}P$

$\rightarrow \Sigma F_x = 0$;

$C_x - T\sin\theta = 0$

$\Rightarrow \quad C_x = T\sin\theta = \dfrac{2}{3}P\sin 60° = 0.5773\ P$

$\Rightarrow \quad \mathbf{C}_x = 0.577\ P \rightarrow$

$\uparrow \Sigma F_y = 0$;

$C_y + T - P + T\cos\theta = 0$

$\Rightarrow \quad C_y = -T + P - T\cos\theta = -\dfrac{2}{3}P + P - \dfrac{2}{3}P\cos 60° = 0$

$\Rightarrow \quad \mathbf{C} = 0.577\ P \rightarrow$