

[5.1절]

5.29 S; 단위 길이 당 질량 $\rho a = 4.73 \text{ kg/m}$
 \Rightarrow 선재의 무게와 무게중심, 강체의 평형

A; 선재의 도심 (= 무게중심)

① $L = 1.35 \text{ m}, \bar{x} = \frac{1}{2}(1.35 \text{ m}) = 0.675 \text{ m}$

② $L = 0.6 \text{ m}, \bar{x} = \frac{1}{2}(0.6 \text{ m}) = 0.3 \text{ m}$

③ $L = 0.75 \text{ m}, \bar{x} = 0$

④ $L = 0.75 \text{ m}, \bar{x} = 0.2 \text{ m}$

⑤ $L = \frac{1}{4}(2\pi R) = \frac{1}{2}\pi(0.75 \text{ m}) = 1.1781 \text{ m}, \bar{x} = 0.6 + \frac{2}{\pi}(0.75 \text{ m}) = 1.0774 \text{ m}$

$\Sigma L = 1.35 + 0.6 + 0.75 + 0.75 + 1.1781 \text{ m} = 4.628 \text{ m}$

$\Sigma(\bar{x}L) = (0.675)(1.35) + (0.3)(0.6) + (0)(0.75) + (0.2)(0.75) + (1.0774)(1.1781) \text{ m}^2$
 $= 2.511 \text{ m}^2$

$\bar{X} = \frac{\Sigma(\bar{x}L)}{\Sigma L} = \frac{2.511 \text{ m}^2}{4.628 \text{ m}} = 0.5424 \text{ m}$

$W = \rho a \Sigma L = (4.73 \text{ kg/m})(4.628 \text{ m})(9.81 \text{ m/s}^2) = 214.7 \text{ N}$

(a) $\Sigma M_C = 0; -W\bar{X} + \frac{3}{5}T_{BA}d_y = 0$

$\Rightarrow T_{BA} = W \frac{\bar{X}}{\frac{3}{5}d_y} = (214.7 \text{ N}) \frac{0.5424 \text{ m}}{0.6(0.75+0.8 \text{ m})}$

$= (214.7 \text{ N})(0.5832) = 125.22 \text{ N} \Rightarrow T_{BA} = 125.2 \text{ N}$

(b) $\Sigma F_x = 0; C_x - \frac{3}{5}T_{BA} = 0$

$\Rightarrow C_x = 0.6T_{BA} = 0.6(125.22 \text{ N}) = 75.13 \text{ N}$

$\Sigma F_y = 0; C_y - W + \frac{4}{5}T_{BA} = 0$

$\Rightarrow C_y = W - 0.8T_{BA} = (214.7 \text{ N}) - 0.8(125.22 \text{ N}) = 114.52 \text{ N}$

$C = \sqrt{C_x^2 + C_y^2} = \sqrt{(75.13 \text{ N})^2 + (114.52 \text{ N})^2} = 136.97 \text{ N}$

$\tan\theta = \frac{C_y}{C_x} = \frac{114.52 \text{ N}}{75.13 \text{ N}} = 1.5243 \Rightarrow \theta = \tan^{-1}(1.5243) = 56.73^\circ$

$\Rightarrow \mathbf{C} = 137.0 \text{ N} \angle 56.7^\circ$

R; (과정의 타당성 검토)

$\frac{3}{5}T_{BA}d_y = 0.6(125.22 \text{ N})(0.75+0.8 \text{ m}) = 116.45 \text{ Nm}$

$\frac{3}{5}T_{BA}d_{y1} + \frac{4}{5}T_{BA}d_{x1} = 0.6(125.22 \text{ N})(0.75 \text{ m}) + 0.8(125.22 \text{ N})(0.6 \text{ m})$
 $= 116.45 \text{ Nm}$

T; (결과의 의미 검토) 반력 방향 ($C_x \rightarrow, C_y \uparrow$) 과 T_{BA}, W 의 관계

