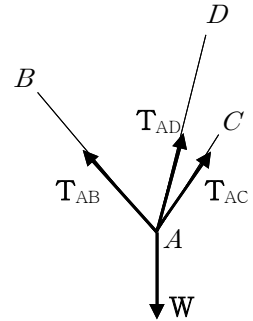{2.5절}

2.99

S; (전략)

M; 자유물체도(F.B.D.)

A; T_{AB} = 6 kN, $\mathbf{W}$ = $-$ W $\mathbf{j}$

$$d_{AB} = \sqrt{(-450\,\text{mm})^2 + (600\,\text{mm})^2 + 0} = 750\ \text{mm}$$

$$\boldsymbol{\lambda}_{AB} = \frac{1}{750}(-450\ \mathbf{i} + 600\ \mathbf{j})$$

$$= -0.60\ \mathbf{i} + 0.80\ \mathbf{j}$$

$$\mathbf{T}_{AB} = T_{AB}\,\boldsymbol{\lambda}_{AB} = (6\ \text{kN})\,(-0.60\ \mathbf{i} + 0.80\ \mathbf{j})$$

$$= (-3.60\ \text{kN})\ \mathbf{i} + (4.80\ \text{kN})\ \mathbf{j}$$

$$d_{AC} = \sqrt{0 + (600\,\text{mm})^2 + (-320\,\text{mm})^2} = 680\ \text{mm}$$

$$\boldsymbol{\lambda}_{AC} = \frac{1}{680}(600\ \mathbf{j} - 320\ \mathbf{k}) = 0.8823\ \mathbf{j} - 0.4705\ \mathbf{k}$$

$$\mathbf{T}_{AC} = T_{AC}\,\boldsymbol{\lambda}_{AC} = T_{AC}\,(0.8823\ \mathbf{j} - 0.4705\ \mathbf{k})$$

$$d_{AD} = \sqrt{(500\,\text{mm})^2 + (600\,\text{mm})^2 + (360\,\text{mm})^2} = 860\ \text{mm}$$

$$\boldsymbol{\lambda}_{AD} = \frac{1}{860}(500\ \mathbf{i} + 600\ \mathbf{j} + 360\ \mathbf{k}) = 0.5813\ \mathbf{i} + 0.6976\ \mathbf{j} + 0.4186\ \mathbf{k}$$

$$\mathbf{T}_{AD} = T_{AD}\,\boldsymbol{\lambda}_{AD} = T_{AD}\,(0.5813\ \mathbf{i} + 0.6976\ \mathbf{j} + 0.4186\ \mathbf{k})$$

$\Sigma\mathbf{F} = 0 \Rightarrow \quad \mathbf{T}_{AB} + \mathbf{T}_{AC} + \mathbf{T}_{AD} + \mathbf{W} = 0$

$\Sigma F_x = 0$; $(-3.60\ \text{kN}) + 0 + 0.5813\,T_{AD} = 0$ ⋯ ①

$\Sigma F_y = 0$; $(4.80\ \text{kN}) + 0.8823\,T_{AC} + 0.6976\,T_{AD} - W = 0$ ⋯ ②

$\Sigma F_z = 0$; $0 - 0.4705\,T_{AC} + 0.4186\,T_{AD} = 0$ ⋯ ③

① $\Rightarrow$ $T_{AD} = \dfrac{3.60\ \text{kN}}{0.5813} = 6.193\ \text{kN}$

③ $\Rightarrow$ $T_{AC} = \dfrac{1}{0.4705}[0.4186\,(6.193\ \text{kN})] = 5.509\ \text{kN}$

② $\Rightarrow$ $W = (4.80\ \text{kN}) + 0.8823\,(5.509\ \text{kN}) + 0.6976\,(6.193\ \text{kN}) = 13.980\ \text{kN}$

$\Rightarrow$ $W = 13.98\ \text{kN}$

R; (과정의 타당성)

T; (결과 검토)