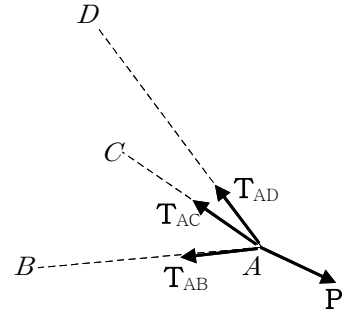


[2.5절]

2.107  $T_{AD} = 305 \text{ N}$

S; known  $T_{AD}$ , 좌표들, unknown  $T_{AB}$ ,  $T_{AC}$ ,  $P$  M;  
 $\Rightarrow$  공간에서 힘의 직각성분 (좌표 이용), 평형



A;  $\mathbf{P} = P \mathbf{i}$

$$d_{AB} = \sqrt{(-960 \text{ mm})^2 + (-240 \text{ mm})^2 + (380 \text{ mm})^2} = 1,060 \text{ mm}$$

$$\lambda_{AB} = \frac{1}{1,060}(-960 \mathbf{i} - 240 \mathbf{j} + 380 \mathbf{k}) = -0.9057 \mathbf{i} - 0.2264 \mathbf{j} + 0.3585 \mathbf{k}$$

$$\mathbf{T}_{AB} = T_{AB} \lambda_{AB} = T_{AB} (-0.9057 \mathbf{i} - 0.2264 \mathbf{j} + 0.3585 \mathbf{k})$$

$$d_{AC} = \sqrt{(-960 \text{ mm})^2 + (-240 \text{ mm})^2 + (-320 \text{ mm})^2} = 1,040 \text{ mm}$$

$$\lambda_{AC} = \frac{1}{1,040}(-960 \mathbf{i} - 240 \mathbf{j} - 320 \mathbf{k}) = -0.9231 \mathbf{i} - 0.2308 \mathbf{j} - 0.3077 \mathbf{k}$$

$$\mathbf{T}_{AC} = T_{AC} \lambda_{AC} = T_{AC} (-0.9231 \mathbf{i} - 0.2308 \mathbf{j} - 0.3077 \mathbf{k})$$

$$d_{AD} = \sqrt{(-960 \text{ mm})^2 + (960 - 240 \text{ mm})^2 + (-220 \text{ mm})^2} = 1,220 \text{ mm}$$

$$\lambda_{AD} = \frac{1}{1,220}(-960 \mathbf{i} + 720 \mathbf{j} - 220 \mathbf{k}) = -0.7869 \mathbf{i} + 0.5902 \mathbf{j} - 0.1803 \mathbf{k}$$

$$\mathbf{T}_{AD} = T_{AD} \lambda_{AD} = (305 \text{ N}) (-0.7869 \mathbf{i} + 0.5902 \mathbf{j} - 0.1803 \mathbf{k}) = -(240 \text{ N}) \mathbf{i} + (180.0 \text{ N}) \mathbf{j} - (55.0 \text{ N}) \mathbf{k}$$

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

$$\Sigma F_x = 0 ; -0.9057 T_{AB} - 0.9231 T_{AC} + (-240 \text{ N}) + P = 0 \quad \dots \textcircled{1}$$

$$\Sigma F_y = 0 ; -0.2264 T_{AB} - 0.2308 T_{AC} + (180.0 \text{ N}) = 0 \quad \dots \textcircled{2}$$

$$\Sigma F_z = 0 ; 0.3585 T_{AB} - 0.3077 T_{AC} + (-55.0 \text{ N}) = 0 \quad \dots \textcircled{3}$$

$$\textcircled{2} \times 0.3077 - \textcircled{3} \times 0.2308$$

$$[(-0.2264)(0.3077) - (0.3585)(0.2308)] T_{AB} + [(180.0 \text{ N})(0.3077) - (-55.0 \text{ N})(0.2308)] = 0$$

$$\Rightarrow T_{AB} = 446.7 \text{ N}$$

$$\textcircled{2} \Rightarrow T_{AC} = \frac{1}{0.2308} [(-0.2264)(446.7 \text{ N}) + (180.0 \text{ N})] = 341.7 \text{ N}$$

$$\textcircled{1} \Rightarrow P = (0.9057)(446.7 \text{ N}) + (0.9231)(341.7 \text{ N}) + (240 \text{ N}) = 960.0 \text{ N}$$

$$\Rightarrow P = 960 \text{ N}$$

R; 과정의 타당성 (가령, 공간에서 힘의 직각성분)

T; 결과 검토 (가령, 세 힘의  $y$ 성분의 합 또는  $z$ 성분의 합)