

<2.15 >

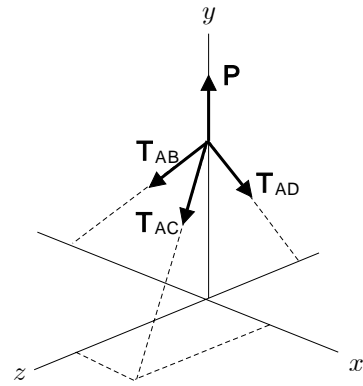
2.103 $T_{AB} = 270 \text{ N}, \quad \mathbf{P} = P \mathbf{j}$

$$\mathbf{d}_{AB} = (-4 \text{ m}) \mathbf{i} + (-5 \text{ m}) \mathbf{j}$$

$$d_{AB} = \sqrt{(-4 \text{ m})^2 + (-5 \text{ m})^2 + 0} = 6.403 \text{ m}$$

$$\begin{aligned} \lambda_{AB} &= \frac{1}{6.403 \text{ m}} [(-4 \text{ m}) \mathbf{i} + (-5 \text{ m}) \mathbf{j}] \\ &= -0.6247 \mathbf{i} - 0.7809 \mathbf{j} \end{aligned}$$

$$\begin{aligned} \mathbf{T}_{AB} &= (270 \text{ N}) (-0.6247 \mathbf{i} - 0.7809 \mathbf{j}) \\ &= (-168.7 \text{ N}) \mathbf{i} + (-210.8 \text{ N}) \mathbf{j} \end{aligned}$$



$$\mathbf{d}_{AC} = (2 \text{ m}) \mathbf{i} + (-5 \text{ m}) \mathbf{j} + (4 \text{ m}) \mathbf{k}$$

$$d_{AC} = \sqrt{(2 \text{ m})^2 + (-5 \text{ m})^2 + (4 \text{ m})^2} = 6.708 \text{ m}$$

$$\lambda_{AC} = \frac{1}{6.708 \text{ m}} [(2 \text{ m}) \mathbf{i} + (-5 \text{ m}) \mathbf{j} + (4 \text{ m}) \mathbf{k}] = 0.2982 \mathbf{i} - 0.7454 \mathbf{j} + 0.5963 \mathbf{k}$$

$$\mathbf{T}_{AC} = T_{AC} (0.2982 \mathbf{i} - 0.7454 \mathbf{j} + 0.5963 \mathbf{k})$$

$$\mathbf{d}_{AD} = (-5 \text{ m}) \mathbf{j} + (-3 \text{ m}) \mathbf{k}$$

$$d_{AD} = \sqrt{0 + (-5 \text{ m})^2 + (-3 \text{ m})^2} = 5.831 \text{ m}$$

$$\lambda_{AD} = \frac{1}{5.831 \text{ m}} [(-5 \text{ m}) \mathbf{j} + (-3 \text{ m}) \mathbf{k}] = -0.8574 \mathbf{j} - 0.5144 \mathbf{k}$$

$$\mathbf{T}_{AD} = T_{AD} (-0.8574 \mathbf{j} - 0.5144 \mathbf{k})$$

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

$$F_x = 0 ; \quad (-168.7 \text{ N}) + 0.2982 T_{AC} + 0 + 0 = 0 \quad \dots$$

$$F_y = 0 ; \quad (-210.8 \text{ N}) - 0.7454 T_{AC} - 0.8574 T_{AD} + P = 0 \quad \dots$$

$$F_z = 0 ; \quad 0 + 0.5963 T_{AC} - 0.5144 T_{AD} + 0 = 0 \quad \dots$$

$$T_{AC} = \frac{168.7 \text{ N}}{0.2982} = 565.7 \text{ N}$$

$$T_{AD} = \frac{0.5963}{0.5144} (565.7 \text{ N}) = 655.8 \text{ N}$$

$$P = (210.8 \text{ N}) + 0.7454 (565.7 \text{ N}) + 0.8574 (655.8 \text{ N}) = 1194.8$$

$$\mathbf{P} = 1194 \text{ N}$$

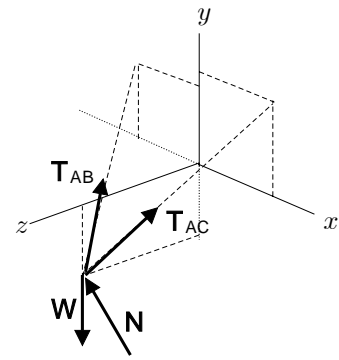
$$2.121 \quad W = (200 \text{ kg}) (9.81 \text{ m/s}^2) = 1962 \text{ N}$$

$$W = (-1962 \text{ N}) \mathbf{j}$$

$$A(0, -0.5 \text{ m}, 1 \text{ m})$$

$$B(-0.6 \text{ m}, 0.8 \text{ m}, 0)$$

$$C(0.7 \text{ m}, 0.9 \text{ m}, 0)$$



$$\mathbf{d}_{AB} = (-0.6 \text{ m}) \mathbf{i} + (1.3 \text{ m}) \mathbf{j} + (-1.0 \text{ m}) \mathbf{k}$$

$$d_{AB} = \sqrt{(-0.6 \text{ m})^2 + (1.3 \text{ m})^2 + (-1.0 \text{ m})^2} = 1.7464 \text{ m}$$

$$\begin{aligned} \lambda_{AB} &= \frac{1}{1.7464 \text{ m}} [(-0.6 \text{ m}) \mathbf{i} + (1.3 \text{ m}) \mathbf{j} + (-1.0 \text{ m}) \mathbf{k}] \\ &= -0.3436 \mathbf{i} + 0.7444 \mathbf{j} - 0.5726 \mathbf{k} \end{aligned}$$

$$\mathbf{T}_{AB} = T_{AB} (-0.3436 \mathbf{i} + 0.7444 \mathbf{j} - 0.5726 \mathbf{k})$$

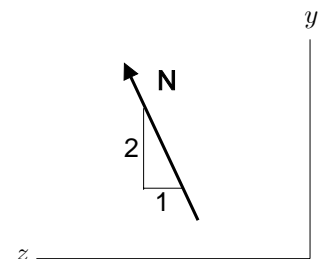
$$\mathbf{d}_{AC} = (0.7 \text{ m}) \mathbf{i} + (1.4 \text{ m}) \mathbf{j} + (-1.0 \text{ m}) \mathbf{k}$$

$$d_{AC} = \sqrt{(0.7 \text{ m})^2 + (1.4 \text{ m})^2 + (-1.0 \text{ m})^2} = 1.8574 \text{ m}$$

$$\begin{aligned} \lambda_{AC} &= \frac{1}{1.8574 \text{ m}} [(0.7 \text{ m}) \mathbf{i} + (1.4 \text{ m}) \mathbf{j} + (-1.0 \text{ m}) \mathbf{k}] \\ &= 0.3769 \mathbf{i} + 0.7537 \mathbf{j} - 0.5384 \mathbf{k} \end{aligned}$$

$$\mathbf{T}_{AC} = T_{AC} (0.3769 \mathbf{i} + 0.7537 \mathbf{j} - 0.5384 \mathbf{k})$$

$$\mathbf{N} = N \frac{2\mathbf{j} + \mathbf{k}}{\sqrt{5}} = N (0.8944 \mathbf{j} + 0.4472 \mathbf{k})$$



$$\mathbf{F} = 0 \quad \mathbf{W} + \mathbf{T}_{AB} + \mathbf{T}_{AC} + \mathbf{N} = 0$$

$$F_x = 0 ; \quad 0 - 0.3436 T_{AB} + 0.3769 T_{AC} + 0 = 0 \quad \dots$$

$$F_y = 0 ; \quad (-1962 \text{ N}) + 0.7444 T_{AB} + 0.7537 T_{AC} + 0.8944 N = 0 \quad \dots$$

$$F_z = 0 ; \quad 0 - 0.5726 T_{AB} - 0.5384 T_{AC} + 0.4472 N = 0 \quad \dots$$

$$0.4472 \times \quad - 0.8944 \times$$

$$(-877.4 \text{ N}) + 0.8450 T_{AB} + 0.8186 T_{AC} = 0 \quad \dots$$

$$0.8186 \times \quad - 0.3769 \times$$

$$0.8186 (-0.3436) T_{AB} - 0.3769 (-877.4 \text{ N}) - 0.3769 (0.8450) T_{AB} = 0$$

$$T_{AB} = 551.38 \text{ N}$$

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$$T_{AC} = \frac{0.3436}{0.3769} T_{AB} = \frac{0.3436}{0.3769} (551.38 \text{ N})$$

$$T_{AC} = 502.66 \text{ N}$$

$$T_{AC} = 503 \text{ N}$$