

{2.9~11 }

2.44 [,]

$$W = 3 \text{ kN,}$$

$$\tan \alpha = \frac{3}{4} \quad \cos \alpha = \frac{4}{5} = 0.8$$

$$\sin \alpha = \frac{3}{5} = 0.6$$

$$\tan \beta = \frac{500}{525} = \frac{20}{21}, \quad \sqrt{21^2 + 20^2} = 29$$

$$\cos \beta = \frac{21}{29} = 0.7241$$

$$\sin \beta = \frac{20}{29} = 0.6897$$

$$F_x = 0; \quad -T_{CA} \cos \alpha + T_{CB} \cos \beta = 0 \quad \dots$$

$$F_y = 0; \quad T_{CA} \sin \alpha + T_{CB} \sin \beta - W = 0 \quad \dots$$

(a) $x \sin \beta - x \cos \beta$

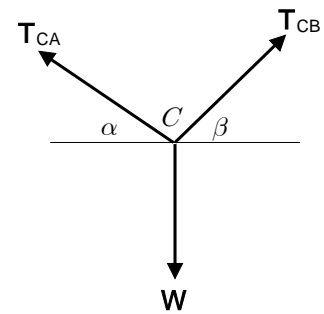
$$-T_{CA} (\cos \alpha \sin \beta + \sin \alpha \cos \beta) + W \cos \beta = 0$$

$$T_{CA} = W \frac{\cos \beta}{\cos \alpha \sin \beta + \sin \alpha \cos \beta} = (3 \text{ kN}) \frac{0.7241}{(0.8)(0.6897) + (0.6)(0.7241)}$$

$$= 2.2027 \text{ kN} \quad T_{CA} = 2.20 \text{ kN}$$

(b) $T_{CB} = T_{CA} \frac{\cos \alpha}{\cos \beta} = (2.2027 \text{ kN}) \frac{0.8}{0.7241} = 2.4336 \text{ kN}$

$$T_{CB} = 2.43 \text{ kN}$$



2.52 [,]

$$F_A = 1.9 \text{ kN,} \quad F_C = 2.4 \text{ kN}$$

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$$F_x = 0;$$

$$F_A \cos 30^\circ - F_B \cos 30^\circ + F_C \cos 45^\circ - F_D \cos 45^\circ = 0$$

$$\frac{\sqrt{3}}{2} F_A - \frac{\sqrt{3}}{2} F_B + \frac{\sqrt{2}}{2} F_C - \frac{\sqrt{2}}{2} F_D = 0 \quad \dots$$

$$F_y = 0;$$

$$-F_A \sin 30^\circ - F_B \sin 30^\circ + F_C \sin 45^\circ + F_D \sin 45^\circ = 0$$

$$-\frac{1}{2} F_A - \frac{1}{2} F_B + \frac{\sqrt{2}}{2} F_C + \frac{\sqrt{2}}{2} F_D = 0 \quad \dots$$

$$+ F_A \left(\frac{\sqrt{3}}{2} - \frac{1}{2} \right) - F_B \left(\frac{\sqrt{3}}{2} + \frac{1}{2} \right) + \sqrt{2} F_C = 0$$

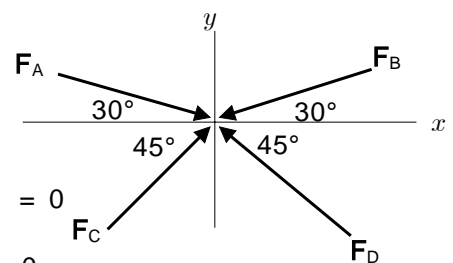
$$F_B = \frac{(\sqrt{3}-1)F_A + 2\sqrt{2}F_C}{\sqrt{3}+1}$$

$$= \frac{(1.732-1)(1.9 \text{ kN}) + 2(1.414)(2.4 \text{ kN})}{1.732+1} = 2.993 \text{ kN}$$

$$F_B = 2.99 \text{ kN}$$

$$F_D = \frac{F_A + F_B - \sqrt{2} F_C}{\sqrt{2}} = \frac{(1.9 \text{ kN}) + (2.993 \text{ kN}) - 1.414(2.4 \text{ kN})}{1.414} = 1.0604 \text{ kN}$$

$$F_D = 1.060 \text{ kN}$$



$$F_x = 0; \quad F_A \sin 15^\circ - F_B \cos 15^\circ + F_C = 0$$

$$F_B = \frac{F_A \sin 15^\circ + F_C}{\cos 15^\circ} = \frac{(1.9 \text{ kN}) \sin 15^\circ + (2.4 \text{ kN})}{\cos 15^\circ} = 2.9938 \text{ kN}$$

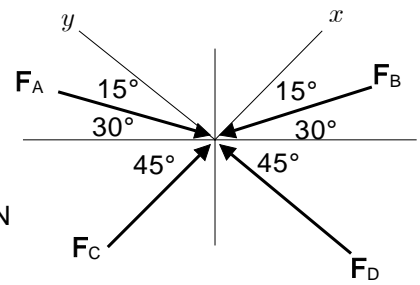
$$F_B = 2.99 \text{ kN}$$

$$F_y = 0; \quad -F_A \cos 15^\circ + F_B \sin 15^\circ + F_D = 0$$

$$F_D = F_A \cos 15^\circ - F_B \sin 15^\circ$$

$$= (1.9 \text{ kN}) \cos 15^\circ - (2.9938 \text{ kN}) \sin 15^\circ = 1.0604 \text{ kN}$$

$$F_D = 1.060 \text{ kN}$$



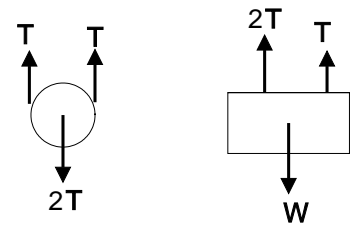
2.69 [,]

$$m = 280 \text{ kg}, \quad W = (280 \text{ kg})(9.81 \text{ m/s}^2) = 2746.8 \text{ N}$$

(b) $F_y = 0; \quad 3T + T - W = 0$

$$T = \frac{W}{3} = \frac{2746.8 \text{ N}}{3} = 915.6 \text{ N}$$

$$T = 916 \text{ N}$$



(d) $F_y = 0; \quad 3T + T - W = 0$

$$T = \frac{W}{4} = \frac{2746.8 \text{ N}}{4} = 686.7 \text{ N}$$

$$T = 687 \text{ N}$$

