

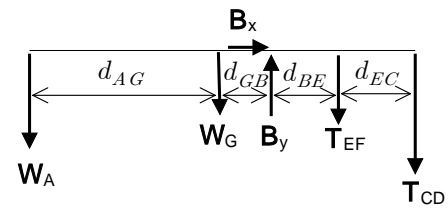
<4.1~4.5 >

4.4 [(), (,)]

$$W_A = 25 \text{ kN}, \quad T_{EF} = 25 \text{ kN}, \quad W_G = 3 \text{ kN}$$

$$d_{AG} = 2.0 \text{ m}, \quad d_{GB} = 0.6 \text{ m},$$

$$d_{BE} = 0.4 \text{ m}, \quad d_{EC} = 0.3 \text{ m}$$



$$(a) \quad +\uparrow M_B = 0 ;$$

$$W_A (d_{AG} + d_{GB}) + W_G d_{GB} - T_{EF} d_{BE} - T_{CD} (d_{BE} + d_{EC}) = 0$$

$$T_{CD} = \frac{W_A (d_{AG} + d_{GB}) + W_G d_{GB} - T_{EF} d_{BE}}{d_{BE} + d_{EC}}$$

$$= \frac{(25 \text{ kN})(2.0 \text{ m} + 0.6 \text{ m}) + (3 \text{ kN})(0.6 \text{ m}) - (25 \text{ kN})(0.4 \text{ m})}{(0.4 \text{ m}) + (0.3 \text{ m})} = 81.14 \text{ kN}$$

$$C \quad T_{CD} = 81.1 \text{ kN}$$

$$(b) \quad F_x = 0 ; \quad B_x = 0$$

$$F_y = 0 ; \quad -W_A - W_G + B_y - T_{EF} - T_{CD} = 0$$

$$B_y = W_A + W_G + T_{EF} + T_{CD}$$

$$= (25 \text{ kN}) + (3 \text{ kN}) + (25 \text{ kN}) + (81.14 \text{ kN}) = 134.14 \text{ kN}$$

$$B = 134.1 \text{ kN}$$

4.21 [(,), (,)]

$$F_A = 6 \text{ N}, \quad \alpha = 30^\circ, \quad \delta = 0.03 \text{ m}$$

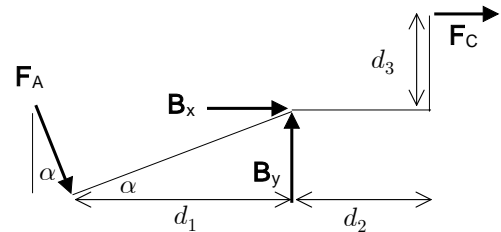
$$d_1 = 0.06 \text{ m}, \quad d_2 = 0.036 \text{ m}, \quad d_3 = 0.022 \text{ m}$$

$$(a) \quad +\uparrow M_B = 0 ;$$

$$F_A \frac{d_1}{\cos \alpha} - F_C d_3 = 0$$

$$F_C = F_A \frac{d_1}{d_3 \cos \alpha} = (6 \text{ N}) \frac{0.06 \text{ m}}{(0.022 \text{ m}) \cos 30^\circ} = 18.895 \text{ N}$$

$$F_C = k \delta \quad k = \frac{F_C}{\delta} = \frac{18.895 \text{ N}}{0.03 \text{ m}} = 630 \text{ N/m} \quad ()$$



$$(b) \quad F_x = 0 ; \quad F_A \sin \alpha + B_x + F_C = 0$$

$$B_x = -F_A \sin \alpha - F_C = -(6 \text{ N}) \sin 30^\circ - (18.895 \text{ N}) = -21.90 \text{ N}$$

$$F_y = 0 ; \quad -F_A \cos \alpha + B_y = 0$$

$$B_y = F_A \cos \alpha = (6 \text{ N}) \cos 30^\circ = 5.196 \text{ N}$$

$$B = \sqrt{B_x^2 + B_y^2} = \sqrt{(-21.90 \text{ N})^2 + (5.196 \text{ N})^2} = 22.51 \text{ N}$$

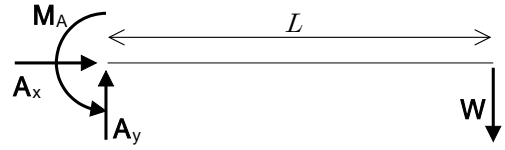
$$\tan \theta = \frac{B_y}{|B_x|} = \frac{5.196 \text{ N}}{21.90 \text{ N}} = 0.2373 \quad \theta = \tan^{-1} 0.2373 = 13.35^\circ$$

$$B = 22.5 \text{ N} \quad \underline{13.4^\circ} \quad ()$$

4.45 [()]

$$W = (10 \text{ kg})(9.81 \text{ m/s}^2) = 98.1 \text{ N}, \quad L = 0.45 \text{ m}$$

(a) $F_x = 0 ; \quad A_x = 0$
 $F_y = 0 ; \quad A_y - W = 0$
 $A_y = W = 98.1 \text{ N}$
 $+ \curvearrowright M_A = 0 ; \quad M_A - WL = 0$



$$M_A = WL = (98.1 \text{ N})(0.45 \text{ m}) = 44.145 \text{ N}\cdot\text{m}$$

$$A = 98.1 \text{ N} \quad , \quad M_A = 44.1 \text{ N}\cdot\text{m} \curvearrowright$$

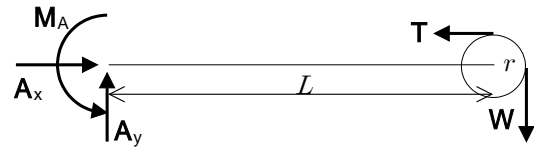
(b) $T = W$

$$F_x = 0 ; \quad A_x - T = 0$$

$$A_x = T = 98.1 \text{ N}$$

$$F_y = 0 ; \quad A_y - W = 0$$

$$A_y = W = 98.1 \text{ N}$$



$$A = \sqrt{A_x^2 + A_y^2} = \sqrt{(98.1 \text{ N})^2 + (98.1 \text{ N})^2} = 138.7 \text{ N}$$

$$\theta = 45^\circ$$

$$+ \curvearrowright M_A = 0 ; \quad M_A + Tr - W(L+r) = 0$$

$$M_A = WL = (98.1 \text{ N})(0.45 \text{ m}) = 44.145 \text{ N}\cdot\text{m}$$

$$A = 138.7 \text{ N} \quad _45^\circ, \quad M_A = 44.1 \text{ N}\cdot\text{m} \curvearrowright$$

(c) $T = W, \quad r = 0.1 \text{ m}$

$$F_x = 0 ; \quad A_x = 0$$

$$F_y = 0 ; \quad A_y - W - T = 0$$

$$A_y = W + T$$

$$= (98.1 \text{ N}) + (98.1 \text{ N}) = 196.2 \text{ N}$$

$$+ \curvearrowright M_A = 0 ; \quad M_A - W(L+r) - T(L-r) = 0$$

$$M_A = W(L+r) + T(L-r)$$

$$= (98.1 \text{ N})(0.45+0.1 \text{ m}) + (98.1 \text{ N})(0.45-0.1 \text{ m}) = 88.3 \text{ N}\cdot\text{m}$$

$$A = 196.2 \text{ N} \quad , \quad M_A = 88.3 \text{ N}\cdot\text{m} \curvearrowright$$

