

&lt;4.1~4.5 &gt;

$$4.3 \quad W_G = 13.5 \text{ kN} = 13500 \text{ N}$$

$$W_C = W_D = m g = (110 \text{ kg})(9.81 \text{ m/s}^2) \\ = 1079.1 \text{ N}$$

F.B.D.

$$(a) \uparrow M_B = 0$$

$$W_C [(1.7 + 2.7) - 0.75 \text{ (m)}] \\ + W_D [2.7 - 0.75 \text{ (m)}] + W_G (1.2 \text{ m}) \\ - 2 F_A [1.8 + 1.2 \text{ (m)}] = 0$$

$$F_A = \frac{1}{2(3.0 \text{ m})} [(1079.1 \text{ N})(3.65 \text{ m}) + (1079.1 \text{ N})(1.95 \text{ m}) + (13500 \text{ N})(1.2 \text{ m})] \\ = \frac{1}{2(3.0 \text{ m})} (22243 \text{ N}\cdot\text{m}) = 3707 \text{ N} \quad \mathbf{F_A = 3710 \text{ N}} \quad ( \quad )$$

$$(b) \uparrow M_A = 0$$

$$W_C [(1.7 + 2.7) - (1.8 + 1.2 + 0.75) \text{ (m)}] \\ - W_D [(1.8 + 1.2 + 0.75) - 2.7 \text{ (m)}] - W_G (1.8 \text{ m}) \\ + 2 F_A [1.8 + 1.2 \text{ (m)}] = 0$$

$$F_B = \frac{1}{2(3.0 \text{ m})} [-(1079.1 \text{ N})(0.65 \text{ m}) + (1079.1 \text{ N})(1.05 \text{ m}) + (13500 \text{ N})(1.8 \text{ m})] \\ = \frac{1}{2(3.0 \text{ m})} (24731 \text{ N}\cdot\text{m}) = 4122 \text{ N} \quad \mathbf{F_B = 4120 \text{ N}} \quad ( \quad )$$

$$( \quad ) \quad F_y = 0$$

$$2 F_A + 2 F_B - W_C - W_D - W_G = 2(3707) + 2(4122) - 1079 - 1079 - 13500 = 0$$

$$4.5 \quad (a) \quad a = 0.10 \text{ m}$$

F.B.D.

$$\uparrow M_B = 0$$

$$F_A (0.12 \text{ m}) + (40 \text{ N})(0.06 \text{ m}) - (30 \text{ N})(0.10 \text{ m}) - (10 \text{ N})(0.180 \text{ m}) = 0$$

$$F_A = \frac{2.4 \text{ N}\cdot\text{m}}{0.12 \text{ m}} = 20.0 \text{ N} \quad \mathbf{F_A = 20.0 \text{ N}}$$

$$\uparrow M_A = 0$$

$$F_B (0.12 \text{ m}) - (40 \text{ N})(0.06 \text{ m}) - (50 \text{ N})(0.12 \text{ m}) - (30 \text{ N})(0.22 \text{ m}) - (10 \text{ N})(0.30 \text{ m}) \\ = 0$$

$$F_B = \frac{18 \text{ N}\cdot\text{m}}{0.12 \text{ m}} = 150.0 \text{ N} \quad \mathbf{F_B = 150.0 \text{ N}}$$

$$(a) \quad a = 0.070 \text{ m}$$

F.B.D.

$$\uparrow M_B = 0$$

$$F_A (0.12 \text{ m}) + (40 \text{ N})(0.06 \text{ m}) - (30 \text{ N})(0.070 \text{ m}) - (10 \text{ N})(0.150 \text{ m}) = 0$$

$$F_A = \frac{1.2 \text{ N}\cdot\text{m}}{0.12 \text{ m}} = 10.00 \text{ N} \quad \mathbf{F_A = 10.00 \text{ N}}$$

$$\uparrow M_A = 0$$

$$F_B (0.12 \text{ m}) - (40 \text{ N})(0.06 \text{ m}) - (50 \text{ N})(0.12 \text{ m}) - (30 \text{ N})(0.19 \text{ m}) - (10 \text{ N})(0.27 \text{ m}) = 0$$

$$F_B = \frac{16.8 \text{ N} \cdot \text{m}}{0.12 \text{ m}} = 140.0 \text{ N}$$

$$F_B = 140.0 \text{ N}$$

4.17 (a)  $\uparrow M_C = 0$

$$-A (1.0 \text{ m}) + (360 \text{ N})(0.25 \text{ m}) + (360 \text{ N})(0.50 \text{ m}) = 0$$

$$A = \frac{1}{1.0 \text{ m}} (270 \text{ N} \cdot \text{m}) = 270 \text{ N}$$

$$A = 270 \text{ N} \quad ( )$$

$$F_y = 0$$

$$C_y + A = 0$$

$$C_y = -A = -270 \text{ N}$$

$$F_x = 0$$

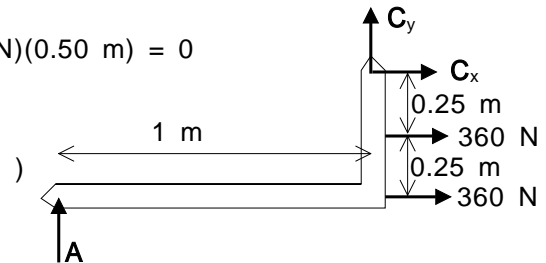
$$C_x + (360 \text{ N}) + (360 \text{ N}) = 0$$

$$C_x = -720 \text{ N}$$

$$C = \sqrt{C_x^2 + C_y^2} = \sqrt{(-720 \text{ N})^2 + (-270 \text{ N})^2} = 768.96 \text{ N}$$

$$\tan \theta = \frac{C_y}{C_x} = \frac{-270}{-720} = 0.375 \quad \theta = \tan^{-1} 0.375 = 20.556^\circ$$

$$C = 769 \text{ N} \quad \angle 20.6^\circ$$



(b)  $\uparrow M_C = 0$

$$-A \cos 30^\circ (1.0 \text{ m}) + A \sin 30^\circ (0.50 \text{ m}) + (360 \text{ N})(0.25 \text{ m}) + (360 \text{ N})(0.50 \text{ m}) = 0$$

$$A = \frac{1}{-0.616 \text{ m}} (270 \text{ N} \cdot \text{m}) = 438.29 \text{ N}$$

$$A = 438 \text{ N} \quad \angle 60^\circ$$

$$F_y = 0$$

$$C_y + A \cos 30^\circ = 0$$

$$C_y = -A \cos 30^\circ = -(438.29 \text{ N}) \cos 30^\circ = -379.57 \text{ N}$$

$$F_x = 0$$

$$C_x + (360 \text{ N}) + (360 \text{ N}) + A \sin 30^\circ = 0$$

$$C_x = -(720 \text{ N}) - (438.29 \text{ N}) \sin 30^\circ = -939.14 \text{ N}$$

$$C = \sqrt{C_x^2 + C_y^2} = \sqrt{(-939.14 \text{ N})^2 + (-379.57 \text{ N})^2} = 1012.94 \text{ N}$$

$$\tan \theta = \frac{C_y}{C_x} = \frac{-379.57}{-939.14} = 0.404 \quad \theta = \tan^{-1} 0.404 = 22.01^\circ$$

$$C = 1013 \text{ N} \quad \angle 22.0^\circ$$

