

<2.12~2.14 >

$$2.73 \text{ (a)} \quad F_y = (900 \text{ N}) \sin 30^\circ = 450.0 \text{ N} \quad F_y = 450 \text{ N}$$

$$F_{xz} = (900 \text{ N}) \cos 30^\circ$$

$$F_x = F_{xz} \cos 25^\circ = (900 \text{ N}) \cos 30^\circ \cos 25^\circ = 706.4 \text{ N} \quad F_x = 706 \text{ N}$$

$$F_z = -F_{xz} \sin 25^\circ = -(900 \text{ N}) \cos 30^\circ \sin 25^\circ = -329.4 \text{ N} \quad F_z = -329 \text{ N}$$

$$\text{(b)} \quad \cos \theta_x = \frac{706.4 \text{ N}}{900 \text{ N}} = 0.78489 \quad \theta_x = \cos^{-1} 0.78489 = 38.3^\circ$$

$$\cos \theta_y = \frac{450.0 \text{ N}}{900 \text{ N}} = 0.5000 \quad \theta_y = \cos^{-1} 0.5000 = 60.0^\circ$$

$$\cos \theta_z = \frac{-329.4 \text{ N}}{900 \text{ N}} = -0.3660 \quad \theta_z = \cos^{-1} (-0.366) = 111.5^\circ$$

$$2.77 \quad F_x = 220.6 \text{ N}$$

$$F_y = F \cos 30^\circ, \quad F_x = (F \sin 30^\circ) \sin 50^\circ, \quad F_z = -(F \sin 30^\circ) \cos 50^\circ$$

$$\text{(a)} \quad F_x = F \sin 30^\circ \sin 50^\circ = 220.6 \text{ N}$$

$$F = \frac{220.6 \text{ N}}{\sin 30^\circ \sin 50^\circ} = 575.95 \text{ N} \quad F = 576 \text{ N}$$

$$\text{(b)} \quad \cos \theta_x = \frac{F_x}{F} = \frac{220.6 \text{ N}}{575.95 \text{ N}} = 0.3830 \quad \theta_x = \cos^{-1} 0.3830 = 67.5^\circ$$

$$F_y = F \cos 30^\circ = (575.95 \text{ N}) \cos 30^\circ = 498.79 \text{ N}$$

$$\cos \theta_y = \frac{F_y}{F} = \frac{498.79 \text{ N}}{575.95 \text{ N}} = 0.86650 \quad \theta_y = \cos^{-1} 0.86605 = 30.0^\circ$$

$$F_z = -F \sin 30^\circ \cos 50^\circ = -(575.95 \text{ N}) \sin 30^\circ \cos 50^\circ = -185.107 \text{ N}$$

$$\cos \theta_z = \frac{F_z}{F} = \frac{-185.107 \text{ N}}{575.95 \text{ N}} = -0.32139 \quad \theta_z = \cos^{-1} (-0.32139) = 108.7^\circ$$

$$2.89 \quad F = 910 \text{ N}$$

$$d_x = 0.8 \text{ m}, \quad d_y = 1.2 \text{ m}, \quad d_z = -0.9 \text{ m}$$

$$d = \sqrt{d_x^2 + d_y^2 + d_z^2} = \sqrt{(0.8 \text{ m})^2 + (1.2 \text{ m})^2 + (-0.9 \text{ m})^2} = 1.7 \text{ m}$$

$$\begin{aligned} \mathbf{F} &= F \lambda = \frac{F}{d} (d_x \mathbf{i} + d_y \mathbf{j} + d_z \mathbf{k}) \\ &= \frac{910 \text{ N}}{1.7 \text{ m}} [(0.8 \text{ m})\mathbf{i} + (1.2 \text{ m})\mathbf{j} + (-0.9 \text{ m})\mathbf{k}] \end{aligned}$$

$$= (428.2 \text{ N})\mathbf{i} + (642.2 \text{ N})\mathbf{j} - (481.8 \text{ N})\mathbf{k}$$

$$F_x = 428 \text{ N}, \quad F_y = 642 \text{ N}, \quad F_z = -482 \text{ N}$$