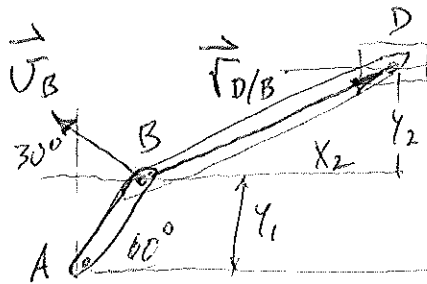


PROB. 15-56

$$\omega_{AB} = 160 \text{ RPM} = 16.75 \frac{\text{RAD}}{\text{SEC}} \text{ CCLW}$$

FIND  $\omega_{BD}$  AND  $v_D$  WHEN  $\theta = 60^\circ$



$$v_{Bk} = r_{AB} \omega_{AB}$$

$$v_B = (3 \text{ IN}) \left( 16.75 \frac{\text{RAD}}{\text{SEC}} \right) = 50.26 \frac{\text{IN}}{\text{SEC}}$$

$$\vec{v}_B = (-50.26 \cdot \cos 30^\circ) \hat{i} + (50.26 \cdot \sin 30^\circ) \hat{j}$$

$$\vec{v}_B = (-43.53) \hat{i} + (25.13) \hat{j} \frac{\text{IN}}{\text{SEC}}$$

$$y_1 = 3 \cdot \sin 60^\circ = 2.598 \text{ IN}$$

$$y_2 = 6 - 2.598 = 3.402 \text{ IN}$$

$$x_2 = \sqrt{10^2 - 3.402^2} = 9.403 \text{ IN}$$

$$\vec{v}_{D/B} = (9.403) \hat{i} + (3.402) \hat{j} \text{ IN}$$

$$\vec{v}_D = \vec{v}_B + \vec{v}_{D/B} = \vec{v}_B + (\omega_{BD}) \hat{k} \times \vec{v}_{D/B}$$

$$(\omega_{BD}) \hat{k} \times \vec{v}_{D/B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & \omega_{BD} \\ 9.403 & 3.402 & 0 \end{vmatrix}$$

$$= [0 - (\omega_{BD})(3.402)] \hat{i} - [0 - (\omega_{BD})(9.403)] \hat{j}$$

$$= (-3.402 \omega_{BD}) \hat{i} + (9.403 \omega_{BD}) \hat{j}$$

PROB. 15-56 CONT.

$$(V_{Dx})_{\hat{L}} = (-43.53)_{\hat{L}} + (25.13)_{\hat{J}} + (-3.402 W_{BD})_{\hat{L}} \\ + (9.403 W_{BD})_{\hat{J}}$$

Y-DIRECTION:

$$0 = 25.13 + 9.403 W_{BD} \Rightarrow \boxed{W_{BD} = -2.672 \frac{\text{RAD}}{\text{SEC}} \curvearrowright}$$

X-DIRECTION:

$$V_{Dx} = -43.53 - 3.402(-2.672) \boxed{= -34.44 \frac{\text{IN}}{\text{SEC}} \leftarrow}$$

Solved