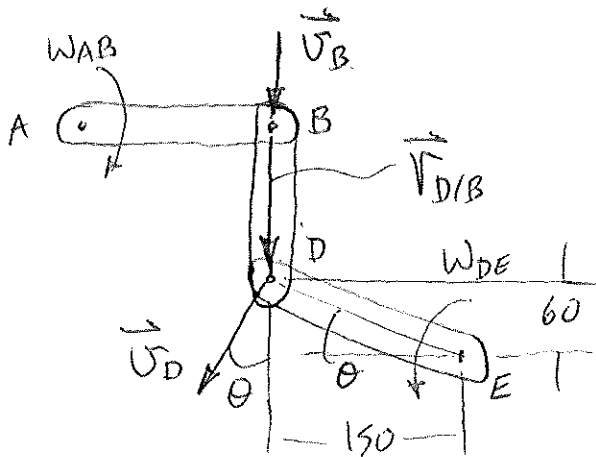


PROB. 15-64

$\omega_{AB} = 4 \frac{\text{RAD}}{\text{SEC}}$ C.W. FIND ω_{BD} AND ω_{DE} .



$$\vec{v}_B = (-r_{AB} \omega_{AB}) \hat{j}$$

$$\theta = \tan^{-1}\left(\frac{60}{150}\right) = 21.80^\circ$$

$$\vec{v}_D = (-v_D \sin 21.8^\circ) \hat{i} + (-v_D \cos 21.8^\circ) \hat{j}$$

$$\vec{v}_D = (-0.3714 v_D) \hat{i} + (-0.9285 v_D) \hat{j}$$

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

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

$$= [0 - (\omega_{BD})(-r_{BD})] \hat{i} = (r_{BD} \omega_{BD}) \hat{i}$$

$$(-0.3714 v_D) \hat{i} + (-0.9285 v_D) \hat{j} = (-r_{AB} \omega_{AB}) \hat{j} + (r_{BD} \omega_{BD}) \hat{i}$$

Y-DIRECTION:

$$-0.9285 v_D = -r_{AB} \omega_{AB}$$

$$v_D = \frac{(250 \text{ mm}) \left(4 \frac{\text{RAD}}{\text{SEC}}\right)}{(0.9285)} = 1077 \frac{\text{MM}}{\text{SEC}}$$

PROB. 15-64 CONT.

X-DIRECTION:

$$-0.3714 v_D = r_{BD} \omega_{BD}$$

$$\omega_{BD} = - \frac{(0.3714)(1077 \frac{\text{mm}}{\text{SEC}})}{(100 \text{ mm})} = -4.0 \frac{\text{RAD}}{\text{SEC}} \curvearrowright$$

$$v_D = r_{DE} \omega_{DE}, \quad r_{DE} = \sqrt{60^2 + 150^2} = 161.5 \text{ mm}$$

$$\omega_{DE} = \frac{(1077 \frac{\text{mm}}{\text{SEC}})}{(161.5 \text{ mm})} = 6.669 \frac{\text{RAD}}{\text{SEC}} \curvearrowleft$$