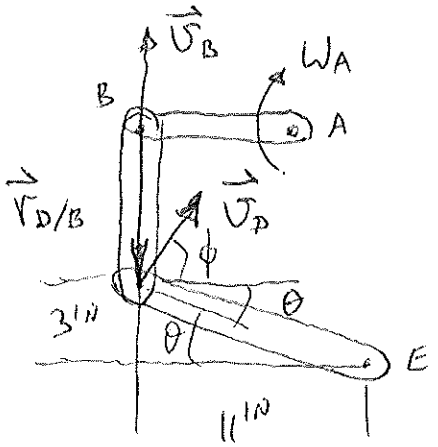
PROB. 15-63

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



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

$\theta = TAN^{-1}\left(\frac{3}{11}\right) = 15.26°$,

$\phi = 90 - 15.26° = 74.74°$

$\vec{v}_D = (v_D \cdot \cos 74.74)\hat{i} + (v_D \cdot \sin 74.74)\hat{j}$

$\vec{v}_D = (0.2632\, v_D)\hat{i} + (0.9647\, v_D)\hat{j}$ $\frac{IN}{SEC}$

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

$$(\omega_{BD})\hat{k} \times (-r_{DB})\hat{j} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & \omega_{BD} \\ 0 & -r_{DB} & 0 \end{vmatrix}$$

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

$(0.2632\, v_D)\hat{i} + (0.9647\, v_D)\hat{j} = (r_{AB}\omega_{AB})\hat{j} + (r_{BD}\omega_{BD})\hat{i}$

Y-DIRECTION:

$0.9647\, v_D = r_{AB}\omega_{AB}$

$v_D = \frac{(7\,IN)\left(4 \frac{RAD}{SEC}\right)}{(0.9647)} = 29.02 \frac{IN}{SEC}$

PROB. 15-63

X-DIRECTION:

$0.2632\, v_D = r_{BD}\, \omega_{BD}$

$$\omega_{BD} = \frac{(0.2632)\left(29.02 \frac{IN}{SEC}\right)}{(8^{IN})} = 0.9549 \frac{RAD}{SEC} \circlearrowright$$

$v_D = r_{DE}\, \omega_{DE}$, $r_{DE} = \sqrt{3^2 + 11^2} = 11.40^{IN}$

$$\omega_{DE} = \frac{v_D}{r_{DE}} = \frac{\left(29.02 \frac{IN}{SEC}\right)}{(11.40^{IN})} = 2.546 \frac{RAD}{SEC} \circlearrowleft$$