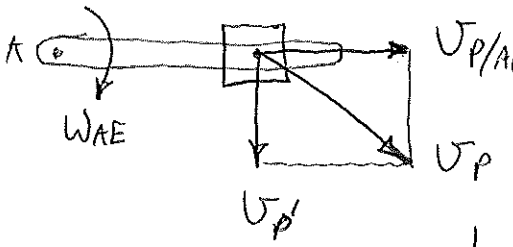
PROB. 15-155

$\omega_{AE} = 3.5 \frac{RAD}{s}\circlearrowleft$, $\omega_{BD} = 2.4 \frac{RAD}{s}\circlearrowleft$, FIND v_P

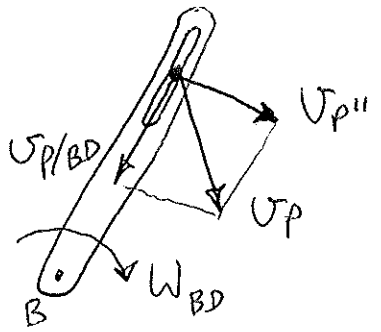


$\vec{v}_{P/AE} = (v_{PAE})\hat{i}$

$$\vec{v}_{P'} = \omega_{AE}\hat{k} \times \vec{r}_{AP} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & -3.5 \\ 11.55 & 0 & 0 \end{vmatrix} = -[0-(-3.5)(11.55)]\hat{j}$$

$\vec{v}_{P'} = (-40.42)\hat{j}$

$\vec{v}_P = (v_{PAE})\hat{i} + (-40.42)\hat{j}$ $\frac{IN}{S}$



$\vec{v}_P = \vec{v}_{P''} + \vec{v}_{P/BD}$

$$\vec{v}_{P''} = \omega_{BD}\hat{k} \times \vec{r}_{BD} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & -2.4 \\ 11.55 & 20 & 0 \end{vmatrix}$$

$\vec{v}_{P''} = [0-(-2.4)(20)]\hat{i} - [0-(-2.4)(11.55)]\hat{j}$

$\vec{v}_{P''} = (48)\hat{i} + (-27.72)\hat{j}$ $\frac{IN}{S}$

$\vec{v}_{P/BD} = (-0.5\, v_{PBD})\hat{i} + (-0.866\, v_{PBD})\hat{j}$

$\vec{v}_P = (48)\hat{i} + (-27.72)\hat{j} + (-0.5\, v_{PBD})\hat{i}$

$+ (-0.866\, v_{PBD})\hat{j}$

PROB. 15-155 CONT.

$$(v_{PAE})\hat{i} + (-40.42)\hat{j} = (48)\hat{i} + (-27.72)\hat{j}$$
$$+ (-0.5\,v_{PBD})\hat{i} + (-0.866\,v_{PBD})\hat{j}$$

X-DIRECTION: $v_{PAE} = 48 - 0.5\,v_{PBD}$

Y-DIRECTION: $-40.42 = -27.72 - 0.866\,v_{PBD}$

$v_{PBD} = 14.66 \frac{in}{s}$

$v_{PAE} = 48 - 0.5(14.66) = 40.67 \frac{in}{s}$

$\vec{v}_p = (40.67)\hat{i} + (-40.42)\hat{j}$, $\theta = \tan^{-1}\left(\frac{40.42}{40.67}\right) = 44.82°$

$\vec{v}_p = 57.34 \frac{in}{s} \searrow 44.82°$