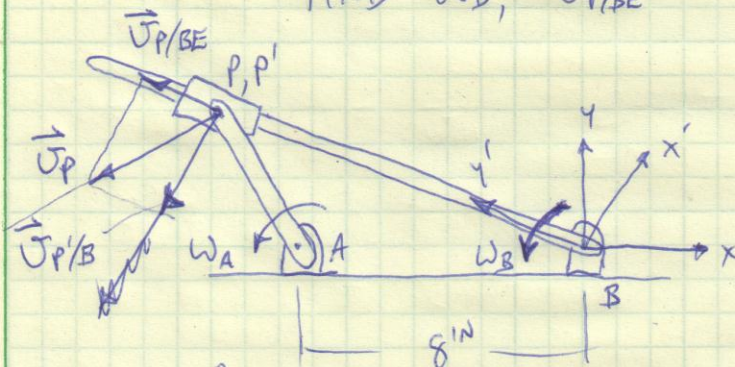


PROB. 15-150

$$\omega_A = 6 \frac{\text{RAD}}{\text{s}} \uparrow, \quad \omega_A = 0$$

FIND  $\omega_B, \quad v_{P/BE}$



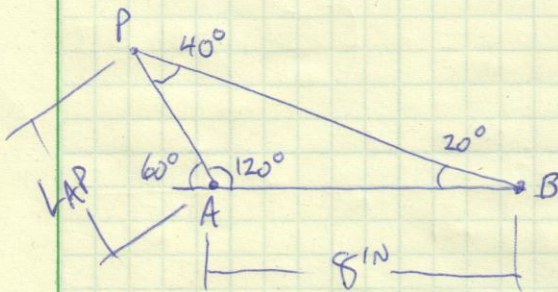
$$\vec{v}_P = \vec{v}_B + \vec{v}_{P/B} + \vec{v}_{P/BE}$$

LOCATE POINTS:

LAW OF SINES:

$$\frac{8}{\sin 40^\circ} = \frac{L_{AP}}{\sin 20^\circ}$$

$$L_{AP} = \left( \frac{\sin 20^\circ}{\sin 40^\circ} \right) \cdot 8 = 4.257 \text{ in}$$



$$x_P = -8 - 4.257 \cdot \cos 60^\circ = -10.13 \text{ in}$$

$$y_P = 4.257 \cdot \sin 60^\circ = 3.687 \text{ in}$$

$$B(0,0), \quad A(-8,0), \quad P(-10.13, 3.687) \text{ in}$$

FOR BAR AP:

$$\vec{v}_P = \vec{v}_A + \omega_A \hat{k} \times \vec{r}_{P/A}$$

$$\vec{r}_{P/A} = [(-10.13) - (-8)] \hat{i} + [(3.687) - 0] \hat{j}$$

$$\vec{r}_{P/A} = (-2.13) \hat{i} + (3.687) \hat{j} \text{ in}$$

PROB. 15-150 CONT.

$$\vec{V}_P = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & 6 \\ -2.13 & 3.687 & 0 \end{vmatrix}$$

$$= [0 - (6)(3.687)]\hat{i} - [0 - (6)(-2.13)]\hat{j}$$

$$\vec{V}_P = (-22.12)\hat{i} + (-12.78)\hat{j} \frac{\text{IN}}{\text{s}}$$

FOR BODY BE:

$$\vec{V}_{P'/B} = \vec{V}_B + \omega_B \hat{k} \times \vec{r}_{P'/B} \quad \vec{r}_{P'/B} = (-10.13)\hat{i} + (3.687)\hat{j} \text{ IN}$$

$$\vec{V}_{P'/B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & \omega_B \\ -10.13 & 3.687 & 0 \end{vmatrix}$$

$$= [0 - (\omega_B)(3.687)]\hat{i} - [0 - (\omega_B)(-10.13)]\hat{j}$$

$$\vec{V}_{P'/B} = (-3.687\omega_B)\hat{i} + (-10.13\omega_B)\hat{j} \frac{\text{IN}}{\text{s}}$$

$$\vec{V}_{P/BE} = (-V_{P/BE} \cdot \cos 20^\circ)\hat{i} + (V_{P/BE} \cdot \sin 20^\circ)\hat{j}$$

$$V_{P/BE} = (-0.9397 V_{P/BE})\hat{i} + (0.3420 V_{P/BE})\hat{j} \frac{\text{IN}}{\text{s}}$$

PROB. 15-150 CONT.

$$\vec{V}_P = \vec{V}_{P/B} + \vec{V}_{P/BE}$$

$$(-22.12)\hat{i} + (-12.78)\hat{j} = (-3.687\omega_B)\hat{i} + (-10.13\omega_B)\hat{j} \\ + (-0.9397V_{P/BE})\hat{i} + (0.3420V_{P/BE})\hat{j}$$

X-DIRECTION:  $-22.12 = -3.687\omega_B - 0.9397V_{P/BE}$

$$\omega_B = 6.0 - 0.2549V_{P/BE}$$

Y-DIRECTION:  $-12.78 = -10.13\omega_B + 0.342V_{P/BE}$

$$-12.78 = -10.13(6 - 0.2549V_{P/BE}) + 0.342V_{P/BE}$$

$$-12.78 = -60.78 + 2.582V_{P/BE} + 0.342V_{P/BE}$$

$$V_{P/BE} = 16.42 \frac{\text{IN}}{\text{S}} \quad \swarrow 20^\circ$$

$$\omega_B = 6 - 0.2549(16.42)$$

$$\omega_B = 1.816 \frac{\text{RAD}}{\text{S}} \quad \uparrow$$