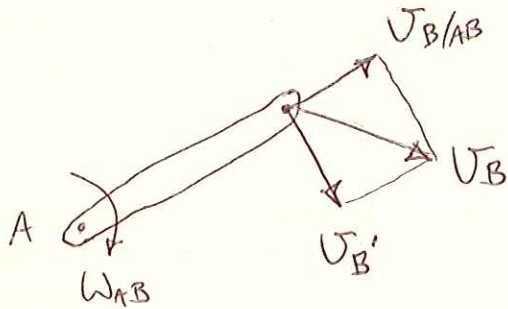


PROB. 15-161

$\vec{v}_{B/AB} = 0.2 \frac{m}{s} \angle 30^\circ$, $\omega_{AB} = 0.08 \frac{RAD}{s}$ \uparrow , FIND v_B AND θ_B

$$\vec{v}_B = \vec{v}_{B'} + \vec{v}_{B/AB}$$



$$\vec{v}_{B'} = \vec{v}_A + \omega_{AB} \hat{k} \times \vec{r}_{B'/A}$$

$$\vec{v}_{B'} = (5.196) \hat{i} + (3) \hat{j} \text{ m/s}$$

$$\vec{v}_{B'} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & -0.08 \\ 5.196 & 3 & 0 \end{vmatrix} = (0.24) \hat{i} + (-0.4157) \hat{j} \frac{m}{s}$$

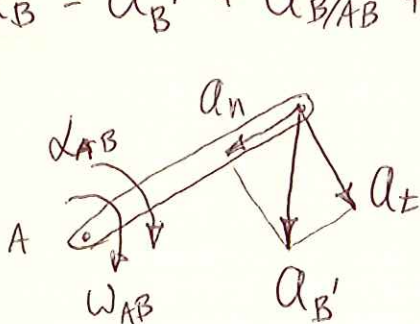
$$\vec{v}_{B/AB} = (0.1732) \hat{i} + (0.1) \hat{j} \frac{m}{s}$$

$$\vec{v}_B = (0.24) \hat{i} + (-0.4157) \hat{j} + (0.1732) \hat{i} + (0.1) \hat{j}$$

$$\vec{v}_B = (0.4132) \hat{i} + (-0.3157) \hat{j} \frac{m}{s}, \theta = \tan^{-1} \left(\frac{0.3157}{0.4132} \right) = 37.38^\circ$$

$$\vec{v}_B = 0.52 \frac{m}{s} \angle 37.38^\circ$$

$$\vec{a}_B = \vec{a}_{B'} + \vec{a}_{B/AB} + \vec{a}_c$$

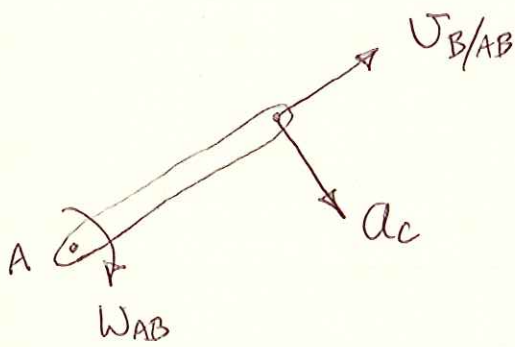


$$\vec{a}_{B'} = \vec{a}_A + \omega_{AB} \hat{k} \times \vec{r}_{B'/A} - \omega_{AB}^2 \vec{r}_{B'/A}$$

$$\vec{a}_{B'} = (-0.03325) \hat{i} + (-0.0192) \hat{j} \frac{m}{s^2}$$

$$\vec{a}_{B/AB} = 0$$

PROB. 15-16 (CONT.)



$$\vec{a}_c = 2 \omega_{AB} \hat{k} \times \vec{V}_{B/AB}$$

$$\vec{a}_c = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & 2(-0.08) \\ 0.1732 & 0.1 & 0 \end{vmatrix}$$

$$\vec{a}_c = [0 - 2(-0.08)(0.1)]\hat{i} - [0 - 2(-0.08)(0.1732)]\hat{j}$$

$$\vec{a}_c = (0.016)\hat{i} + (-0.02771)\hat{j} \frac{m}{s^2}$$

$$\vec{a}_B = (-0.03325)\hat{i} + (-0.0192)\hat{j} + (0.016)\hat{i} + (-0.02771)\hat{j}$$

$$\vec{a}_B = (-0.01725)\hat{i} + (-0.04691)\hat{j}, \quad \theta = \tan^{-1}\left(\frac{0.04691}{0.01725}\right) = 69.81^\circ$$

$$\vec{a}_B = 0.04995 \frac{m}{s^2} \nearrow 69.81^\circ$$