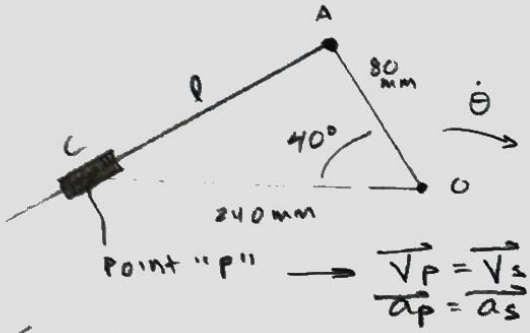
RAHUL GOYAL

PRE LAB 5



GIVEN: Diagram
$\dot{\theta} = -3\hat{k}$ rad/s

FIND: $\vec{V}_S$, $\vec{a}_S$

$\vec{V}_P = \vec{V}_S$
$\vec{a}_P = \vec{a}_S$

SOLVE:

Rotating Axes at C

$\vec{\Omega} = \vec{\omega}_{AB} = \omega_{AB}\hat{k}$

$\vec{V}_C = \vec{V}_A + \vec{V}_{C/A}$

$\vec{0} = -3\hat{k} \times 0.08(\cos 40\,\hat{i} + \sin 40\,\hat{j}) + \vec{V}_S$

$\vec{V}_S = -3\hat{k} \times (-0.0613\hat{i} + 0.514\hat{j})$

$$\boxed{\vec{V}_S = (0.1542\hat{i} + 0.184\hat{j})\ m/s}$$

$\vec{a}_C = \vec{a}_A + \dot{\vec{\Omega}} \times \vec{r}_{C/A} + \vec{\Omega} \times (\vec{\Omega} \times \vec{r}_{C/A}) + 2\vec{\Omega} \times \vec{V}_S + \vec{a}_S$

$0 = \dot{\vec{\theta}} \times \vec{r}_{A0} + \vec{\theta} \times (\vec{\theta} \times \vec{r}_{A0}) + 0 + \dot{\vec{\theta}} \times (\dot{\vec{\theta}} \times \vec{r}_{C/A}) + 2\vec{\theta} \times \vec{V}_S + \vec{a}_S$

$0 = -3\hat{k} \times (-3\hat{k} \times (-0.0613\hat{i} + 0.0514\hat{j})) - 3\hat{k} \times (-3\hat{k} \times (-0.1787\hat{i} - 0.0514\hat{j}))$
$+ 2(-3\hat{k} \times (0.1542\hat{i} + 0.184\hat{j})) + \vec{a}_S$

$\vec{a}_S = -0.4246\hat{j} + 0.552\hat{i} + 1.608\hat{i} + 0.4246\hat{j} - 0.95\hat{j} + 1.104\hat{i}$

$$\boxed{\vec{a}_S = (3.26\hat{i} - 0.96\hat{j})\ m/s}$$