PROB. 15-11

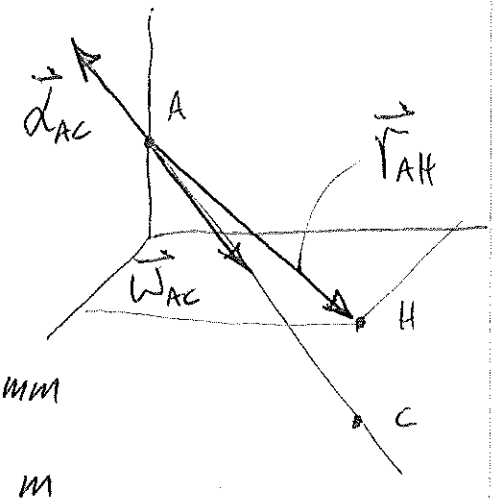
FIND $\vec{a}_H$ FOR $\vec{\omega}_{AC} = 9 \frac{RAD}{s}$ AND $\vec{\alpha}_{AC} = -18 \frac{RAD}{s^2}$

$$\vec{a}_H = \vec{\alpha}_{AC} \times \vec{r}_{AH} + \vec{\omega}_{AC} \times (\vec{\omega}_{AC} \times \vec{r}_{AH})$$

$$\vec{\alpha}_{AC} = |\vec{\alpha}_{AC}| \cdot \vec{\lambda}_{AC} = (-18)[(0.7778)\hat{i} + (-0.4444)\hat{j} + (0.4444)\hat{k}]$$

$$\vec{\alpha}_{AC} = (-14)\hat{i} + (8)\hat{j} + (-8)\hat{k} \quad \frac{RAD}{s^2}$$

FIND POSITION VECTOR $\vec{r}_{AH}$:



$$dx = x_H - x_A = (350) - (0) = 350^{mm}$$

$$dy = y_H - y_A = (0) - (100) = -100^{mm}$$

$$dz = z_H - z_A = (200) - (0) = 200^{mm}$$

$$\vec{r}_{AH} = (350)\hat{i} + (-100)\hat{j} + (200)\hat{k}^{mm}$$

$$\vec{r}_{AH} = (0.35)\hat{i} + (-0.1)\hat{j} + (0.2)\hat{k}^{m}$$

$$\vec{\alpha}_{AC} \times \vec{r}_{AH} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -14 & 8 & -8 \\ 0.35 & -0.1 & 0.2 \end{vmatrix}$$

$$= [(8)(0.2) - (-8)(-0.1)]\hat{i} - [(-14)(0.2) - (-8)(0.35)]\hat{j}$$
$$+ [(-14)(-0.1) - (8)(0.35)]\hat{k}$$

$$\vec{\alpha}_{AC} \times \vec{r}_{AH} = (0.8)\hat{i} + (0)\hat{j} + (-1.4)\hat{k} \quad \frac{m}{s^2}$$

PROB. 15-11 cont.

$$\vec{\omega}_{AC} \times \vec{r}_{AH} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 7 & -4 & 4 \\ 0.35 & -0.1 & 0.2 \end{vmatrix}$$

$$= [(-4)(0.2) - (4)(-0.1)]\hat{i} - [(7)(0.2) - (4)(0.35)]\hat{j}$$
$$+ [(7)(-0.1) - (-4)(0.35)]\hat{k} \ \frac{m}{s}$$

$$\vec{\omega}_{AC} \times \vec{r}_{AH} = (-0.4)\hat{i} + (0)\hat{j} + (0.7)\hat{k} \ \frac{m}{s}$$

$$\vec{\omega}_{AC} \times (\vec{\omega}_{AC} \times \vec{r}_{AH}) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 7 & -4 & 4 \\ -0.4 & 0 & 0.7 \end{vmatrix}$$

$$= [(-4)(0.7) - (4)(0)]\hat{i} - [(0.7)(0.7) - (4)(-0.4)]\hat{j}$$
$$+ [(7)(0) - (-4)(-0.4)]\hat{k} \ \frac{m}{s^2}$$

$$\vec{\omega}_{AC} \times (\vec{\omega}_{AC} \times \vec{r}_{AH}) = (-2.8)\hat{i} + (-6.5)\hat{j} + (-1.6)\hat{k} \ \frac{m}{s^2}$$

$$\vec{a}_H = (0.8 - 2.8)\hat{i} + (0 - 6.5)\hat{j} + (-1.4 - 1.6)\hat{k} \ \frac{m}{s^2}$$

$$\boxed{\vec{a}_H = (-2.0)\hat{i} + (-6.5)\hat{j} + (-3.0)\hat{k} \ \frac{m}{s^2}}$$