PROB. 14-9

$m_A = 3\ kg$, $m_B = 4\ kg$, $m_C = 5\ kg$

$\vec{v}_A = (-4)\hat{i} + (4)\hat{j} + (6)\hat{k}\ \frac{m}{s}$

$\vec{v}_B = (-6)\hat{i} + (8)\hat{j} + (4)\hat{k}\ \frac{m}{s}$

$\vec{v}_C = (2)\hat{i} + (-6)\hat{j} + (-4)\hat{k}\ \frac{m}{s}$

FIND $\vec{H}_o = \Sigma(\vec{r}_i \times m_i \vec{v}_i)$

$\vec{r}_A = (1.2)\hat{i} + (1.5)\hat{k}\ m$

$\vec{r}_B = (0.9)\hat{i} + (1.2)\hat{j} + (1.2)\hat{k}\ m$

$\vec{r}_C = (2.4)\hat{j} + (1.8)\hat{k}\ m$

$$\vec{r}_A \times m_A \vec{v}_A = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1.2 & 0 & 1.5 \\ (3)(-4) & (3)(4) & (3)(6) \end{vmatrix}$$

$$= [0 - (1.5)(12)]\hat{i} - [(1.2)(18) - (1.5)(-12)]\hat{j} + [(1.2)(12) - 0]\hat{k}$$

$$= (-18)\hat{i} + (-39.6)\hat{j} + (14.4)\hat{k}\ \frac{kg \cdot m^2}{s}$$

$$\vec{r}_B \times m_B \vec{v}_B = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0.9 & 1.2 & 1.2 \\ (4)(-6) & (4)(8) & (4)(4) \end{vmatrix}$$

PROB. 14-9 CONT.

$$\vec{r}_B \times m_B \vec{v}_B = [(1.2)(16) - (1.2)(32)]\,\hat{i}$$

$$-[(0.9)(16) - (1.2)(-24)]\,\hat{j} + [(0.9)(32) - (1.2)(-24)]\,\hat{k}$$

$$= (-19.2)\,\hat{i} + (-43.2)\,\hat{j} + (57.6)\,\hat{k} \quad \frac{kg \cdot m^2}{s}$$

$$\vec{r}_C \times m_C \vec{v}_C = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 2.4 & 1.8 \\ (5)(2) & (5)(-6) & (5)(-4) \end{vmatrix}$$

$$= [(2.4)(-20) - (1.8)(-30)]\,\hat{i} - [0 - (1.8)(10)]\,\hat{j}$$

$$+ [0 - (2.4)(10)]\,\hat{k}$$

$$= (6.0)\,\hat{i} + (18.0)\,\hat{j} + (-24.0)\,\hat{k} \quad \frac{kg \cdot m^2}{s}$$

$$\boxed{\vec{H}_O = (-31.2)\,\hat{i} + (-64.8)\,\hat{j} + (48.0)\,\hat{k} \quad \frac{kg \cdot m^2}{s}}$$