PROB. 13-159

$\vec{U}_A = 0$, $\vec{U}_B = 0$, $\vec{U}_C = (-1.5)\hat{\imath}\ \frac{m}{s}$, $e_{B/C} = 0.8$, $M_A = M_B = M_C$

$e_{A/B} = 0.5$, FIND U_A, U_B, U_C AFTER IMPACTS

COLLISION C/B:

MOMENTUM: $M_B \vec{U}_{B,1} + M_C \vec{U}_{C,1} = M_B \vec{U}_{B,2} + M_C \vec{U}_{C,2}$

$\vec{U}_{B,2} + \vec{U}_{C,2} = \vec{U}_{B,1} + \vec{U}_{C,1} = -1.5$

RESTITUTION:

$\vec{U}_{C,2} - \vec{U}_{B,2} = e_{B/C}(\vec{U}_{B,1} - \vec{U}_{C,1})$

$\vec{U}_{C,2} = \vec{U}_{B,2} + 0.8[0 - (-1.5)] = \vec{U}_{B,2} + 1.2$

$\vec{U}_{B,2} + (\vec{U}_{B,2} + 1.2) = -1.5 \Rightarrow \vec{U}_{B,2} = -1.35 \ \frac{m}{s}$

$\vec{U}_{C,2} = -1.35 + 1.2 \boxed{= -0.15 \ \frac{m}{s}}$

COLLISION B/A:

MOMENTUM: $M_A \vec{U}_{A,1} + M_B \vec{U}_{B,2} = M_A \vec{U}_{A,3} + M_B \vec{U}_{B,3}$

$\vec{U}_{A,3} + \vec{U}_{B,3} = -1.35$

RESTITUTION: $\vec{U}_{A,3} - \vec{U}_{B,3} = e_{A/B}(\vec{U}_{B,2} - \vec{U}_{A,1})$

$\vec{U}_{A,3} = \vec{U}_{B,3} + (0.5)(-1.35 - 0)$

$\vec{U}_{A,3} = \vec{U}_{B,3} - 0.675$

$(\vec{U}_{B,3} - 0.675) + \vec{U}_{B,3} = -1.35$

$\boxed{\vec{U}_{B,3} = -0.3375 \ \frac{m}{s}}$

$\vec{U}_{A,3} = -0.3375 - 0.675 \boxed{= -1.012 \ \frac{m}{s}}$