PROB. 14-25

$W = 12^{LB}$, $\vec{U}_o = (40)\hat{\imath} + (-30)\hat{\jmath} + (-1200)\hat{k} \frac{ft}{s}$

$W_A = 5^{LB}$, $W_B = 4^{LB}$, $W_C = 3^{LB}$

FIND V_A, U_B, U_C

$m\vec{U}_o = M_A \vec{U}_A + M_B \vec{U}_B + M_C \vec{U}_C$

$\left(\frac{W}{g}\right)\vec{U}_o = \left(\frac{W_A}{g}\right)\vec{U}_A + \left(\frac{W_B}{g}\right)\vec{U}_B + \left(\frac{W_C}{g}\right)\vec{U}_C$

$W\vec{U}_o = W_A \vec{U}_A + W_B \vec{U}_B + W_C \vec{U}_C$

$\vec{U}_A$: $dx = X_A - X_D = (-5) - (0) = -5^{ft}$

$dy = Y_A - Y_D = 0$

$dz = Z_A - Z_D = 0 - (12) = -12^{ft}$

$d = \sqrt{5^2 + 12^2} = 13^{ft}$

$\vec{U}_A = \left(-\frac{5}{13} U_A\right)\hat{\imath} + \left(-\frac{12}{13} U_A\right)\hat{k} \frac{ft}{s}$

$\vec{U}_B$: $dx = X_B - X_D = 12 - 0 = 12^{ft}$

$dy = Y_B - Y_D = 6 - 0 = 6^{ft}$

$dz = Z_B - Z_D = 0 - (12) = -12^{ft}$

$d = \sqrt{12^2 + 6^2 + 12^2} = 18^{ft}$

$\vec{U}_B = \left(\frac{12}{18} U_B\right)\hat{\imath} + \left(\frac{6}{18} U_B\right)\hat{\jmath} + \left(-\frac{12}{18} U_B\right)\hat{k}$

$\vec{U}_B = \left(\frac{2}{3} U_B\right)\hat{\imath} + \left(\frac{1}{3} U_B\right)\hat{\jmath} + \left(-\frac{2}{3} U_B\right)\hat{k} \frac{ft}{s}$

PROB. 14-25 CONT.

$\vec{U_C}$: $dx = X_C - X_D = 0$

$dy = Y_C - Y_D = (-9) - 0 = -9^{ft}$

$dz = Z_C - Z_D = 0 - (12) = -12^{ft}$

$d = \sqrt{9^2 + 12^2} = 15^{ft}$

$\vec{U_C} = \left(-\dfrac{9}{15} U_C\right)\hat{j} + \left(-\dfrac{12}{15} U_C\right)\hat{k}$

$\vec{U_C} = \left(-\dfrac{3}{5} U_C\right)\hat{j} + \left(-\dfrac{4}{5} U_C\right)\hat{k} \quad \dfrac{ft}{s}$

$(12)\left[(40)\hat{i} + (-30)\hat{j} + (-1200)\hat{k}\right]$

$= (5)\left[\left(-\dfrac{5}{13} U_A\right)\hat{i} + \left(-\dfrac{12}{13} U_A\right)\hat{k}\right]$

$+ (4)\left[\left(\dfrac{2}{3} U_B\right)\hat{i} + \left(\dfrac{1}{3} U_B\right)\hat{j} + \left(-\dfrac{2}{3} U_B\right)\hat{k}\right]$

$+ (3)\left[\left(-\dfrac{3}{5} U_C\right)\hat{j} + \left(-\dfrac{4}{5} U_C\right)\hat{k}\right]$

X-DIRECTION: $480 = -1.923\, U_A + 2.667\, U_B$

Y-DIRECTION: $-360 = 1.333\, U_B - 1.8\, U_C$

Z-DIRECTION: $-14,400 = -4.615\, U_A - 2.667\, U_B - 2.4\, U_C$

$U_A = 1678\, \dfrac{ft}{s}, \quad U_B = 1390\, \dfrac{ft}{s}, \quad U_C = 1229\, \dfrac{ft}{s}$