11.5 Show that for constant body force Z_b acting on an element ($X_b = 0$ and $Y_b = 0$),

$$\{f_{bi}\} = \frac{V}{4}\begin{Bmatrix} 0 \\ 0 \\ Z_b \end{Bmatrix}$$

where $\{f_{bi}\}$ represents the body forces at node i of the element with volume V.

11.6 Evaluate the $\underline{B}$ matrix for the tetrahedral solid element shown in Figure P11–6. The coordinates are in units of millimeters.

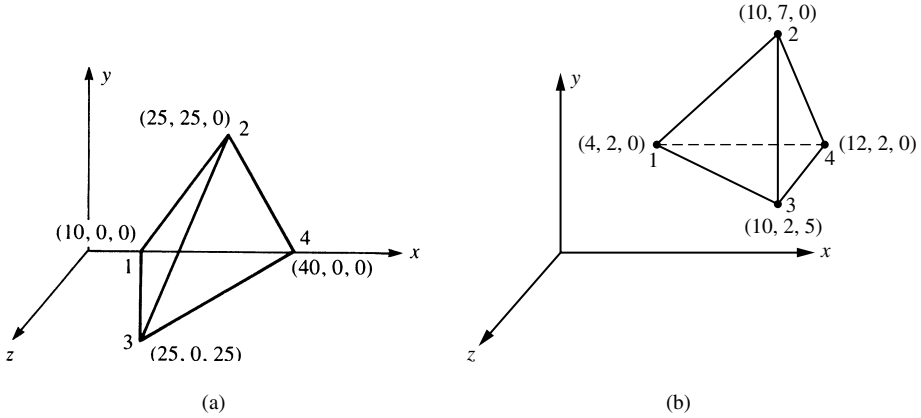

Figure P6–6

11.7 For the element shown in Figure P11–6, assume the nodal displacements have been determined to be

$u_1 = 0.0$	$v_1 = 0.0$	$w_1 = 0.0$
$u_2 = 0.01$ mm	$v_2 = 0.02$ mm	$w_2 = 0.01$ mm
$u_3 = 0.02$ mm	$v_3 = 0.01$ mm	$w_3 = 0.005$ mm
$u_4 = 0.0$	$v_4 = 0.01$ mm	$w_4 = 0.01$ mm

Determine the strains and then the stresses in the element. Let $E = 210$ GPa and $\nu = 0.3$.

11.8 For the linear strain tetrahedral element shown in Figure P11–8, (a) express the displacement fields u, v, and w in the x, y and z directions, respectively. Hint: There are

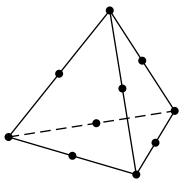

Figure P11–8