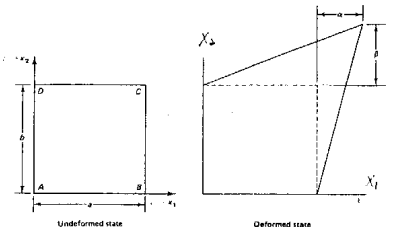
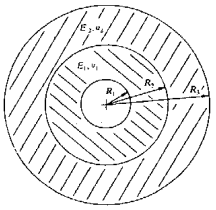
Ph. D. Qualified Examine 計算固力 Oct. 2, 1999

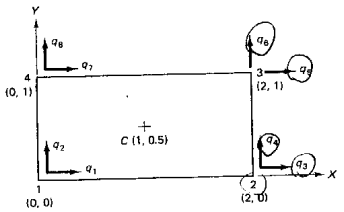
1. Consider a material undergoing a uniformly large deformation as shown, determine the displacement field and strain tensor.



2. Two concentric cylinders as shown, the nominal internal and external radii are R_1, R_2 and R_2, R_3, respectively. There is a small interference of δ between the interfacial radii before compounding. The elastic properties of the inner cylinder are E_1, ν_1, and the outer cylinder are E_2, ν_2. Determine the stress fields in the two cylinders and the pressure on the interface.



3. Consider a rectangular element as shown. Assume plane strain condition, $E = 30\times10^6\ psi$, $\nu = 0.3$ and nodal displacement $q_1 = q_2 = q_7 = q_8 = 0$, $q_3 = 0.002$, $q_4 = 0.003$, $q_5 = 0.006$, $q_6 = 0.0032$, calculate the stresses at nodes 2 and 4.



4. Consider the following displacement field for the formation of a stiffness matrix for beam bending

$$v(x) = a_1 + a_2 x + a_3 x^2 + a_4 \sin(2\alpha x) \quad \text{where } \alpha = \pi / L$$

(a) Determine the matrix equation that relates the constants a_1, a_2, a_3, a_4 to the nodal displacements and rotations at both ends of the beam element.

(b) Derive the stiffness matrix.