

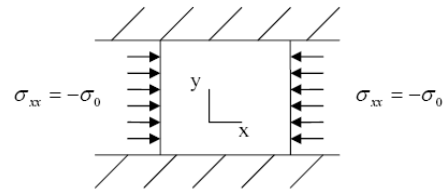
EAS4200C Aerospace Structures Homework #3 (Due: Sep. 25th)

1. For small strains, the volume change $\Delta V/V$ is identified to be equal to $\varepsilon_{xx} + \varepsilon_{yy} + \varepsilon_{zz}$. The bulk modulus K of an isotropic solid is defined as

$$\frac{1}{3}(\sigma_{xx} + \sigma_{yy} + \sigma_{zz}) = K \frac{\Delta V}{V}$$

Derive K in terms of E and ν .

2. A block of elastic solid is compressed by normal stress σ_{xx} as shown in the figure. The containing walls are rigid and smooth (frictionless). Find the values of k for plane strain and plane stress conditions, respectively, in the stress-strain relation obtained from the compression test above.



$$\sigma_{xx} = k\varepsilon_{xx}$$

Assume that $E = 70\text{GPa}$ and $\nu = 0.3$.

3. Consider a thin rectangular panel loaded as shown in the figure. Show that the Airy stress function

$$\phi = c_1x^2 + c_2xy + c_3y^2$$

Solves the problem. Find the constants c_1 , c_2 , and c_3 .

