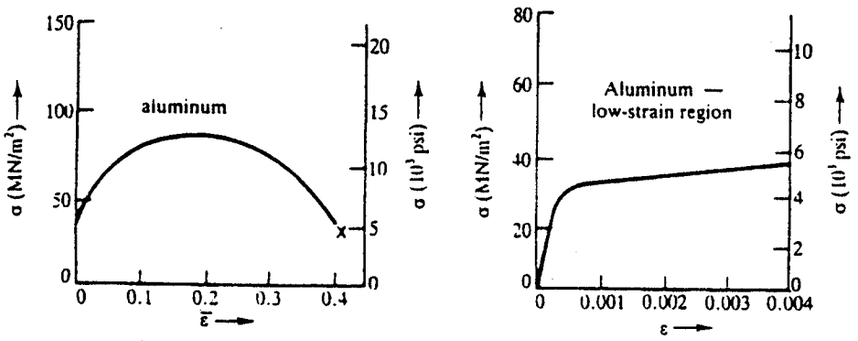
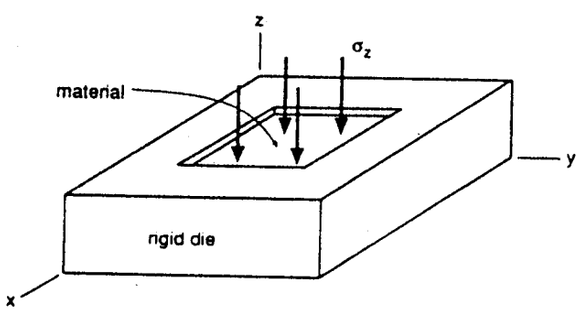
1. (20pts) Please define the following terms:
   (a) bulk modulus,
   (b) volumetrical strain,
   (c) shear center,
   (d) isotropic material,
   (e) maximum elastic moment,
   (f) plastic section modulus,
   (g) idealized elastic-plastic material,
   (h) von Mises yield criterion,
   (i) strain rosette,
   (j) modulus of resilience.

2. (10pts) The nominal tensile stress-strain behavior of pure aluminum is shown in the graphs below. Determine the following properties for pure aluminum. (a) Young's modulus (a) 0.2% offset yield strength, (c) ultimate stress, (d) fracture stress, (e) percent elongation.



3. (20pts) A sample of material subjected to a compressive stress σ_z is confined so that it cannot deform in either x- or y- direction (shown below). The Young's modulus is denoted as E and the Poisson's ratio is ν.
   (a) Do stresses occur in the material in the x- and y- directions? If so, how are they related to σ_z.
   (b) Determine the stiffness $E' = \sigma_z/\varepsilon_z$ in the direction of the applied stress in terms of E and ν for the material. Is E' equal to E from uniaxial loading? Why or why not?
   (c) What happens if Poisson's ratio for the material approaches 0.5?



(背面仍有題目,請繼續作答)

542045

4. (25pts) The safety of a bridge across a river is investigated by inspectors who determine strains $\varepsilon_x = 1200\ \mu$, $\varepsilon_y = -200\ \mu$, and $\gamma_{xy} = 1000\ \mu$. The safety code indicates that the maximum allowable stresses are $\sigma = 20{,}000$ psi and $\tau = 15{,}000$ psi. Based on this strength criteria, is the bridge safe? Use $E = 29 \times 10^6$ psi, $G = 12 \times 10^6$ psi, and $\nu = 0.25$.

5. (25pts) For the cantilever beam shown, determine (a) deflection at end A, (b) the bending moment diagram of the beam . Use E = 200 GPa.