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so many fake sites. this is the first one which worked! Many thanks

Solution Manual 3rd Ed. Metal Forming: Mechanics and Metallurgy
Chapter 1

Determine the principal stresses for the stress state

$$\sigma_{ij} = \begin{vmatrix} 10 & -3 & 4 \\ -3 & 5 & 2 \\ 4 & 2 & 7 \end{vmatrix}$$

Solution: $I_1 = 10+5+7=32$, $I_2 = -(50+35+70)+9+4+16 = -126$, $I_3 = 350-48-40-80-63 = 119$; $\sigma^3 - 22\sigma^2 -126\sigma -119 = 0$. A trial and error solution gives $\sigma = 13.04$. Factoring out 13.04, $\sigma^2 - 8.96\sigma + 9.16 = 0$. Solving: $\sigma_1 = 13.04$, $\sigma_2 = 7.785$, $\sigma_3 = 1.175$.

1-2 A 5-cm. diameter solid shaft is simultaneously subjected to an axial load of 80 kN and a torque of 400 Nm.
a. Determine the principal stresses at the surface assuming elastic behavior.
b. Find the largest shear stress.

Solution: a. The shear stress, τ, at a radius, r, is $\tau = \tau_s r/R$ where $\tau_s$is the shear stress at the surface R is the radius of the rod. The torque, T, is given by $T = \int 2\pi r^2 dr = (2\pi\tau_s/R)\int r^2 dr = \pi\tau_s R^3/2$. Solving for τ, $\tau_s = 2T/(\pi R^3) = 2(400)/(\pi(0.025^3) = 16$ MPa
The axial stress is $.08MN/(\pi 0.025^2) = 4.07$ MPa
$\sigma_1, \sigma_2 = 4.07/2 \pm [(4.07/2)^2 + (16/2)^2]^{1/2} = 1.029, -0.622$ MPa
b. the largest shear stress is (1.229 + 0.623)/2 = 0.925 MPa

A long thin-wall tube, capped on both ends is subjected to internal pressure. During elastic loading, does the tube length increase, decrease or remain constant?
Solution: Let y = hoop direction, x = axial direction, and z = radial direction. –
$\varepsilon_x = e_2 = (1/E)[\sigma - \upsilon(\sigma_3 + \sigma_1)] = (1/E)[\sigma_2 - \upsilon(2\sigma_3)] = (\sigma_2 E)(1-2\upsilon)$
Since $\upsilon < 1/2$ for metals, $\varepsilon_x = e_2$ is positive and the tube lengthens.

4 A solid 2-cm. diameter rod is subjected to a tensile force of 40 kN. An identical rod is subjected to a fluid pressure of 35 MPa and then to a tensile force of 40 kN. Which rod experiences the largest shear stress?
Solution: The shear stresses in both are identical because a hydrostatic pressure has no shear component.

1-5 Consider a long thin-wall, 5 cm in diameter tube, with a wall thickness of 0.25 mm that is capped on both ends. Find the three principal stresses when it is loaded under a tensile force of 40 N and an internal pressure of 200 kPa.
Solution: $\sigma_x = PD/4t + F/(\pi Dt) = 12.2$ MPa
$\sigma_y = PD/2t = 2.0$ MPa
$\sigma_z = 0$

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