8.5-19. (a) Mohr's circle, (b) $\sigma_1 = 12.36$ MPa, $\sigma_2 = -32.4$ MPa, $\theta_{xp1} = -13.28°$, (c) $\tau_{max} = 22.4$ MPa, $\sigma_{s1} = \sigma_{s2} = -10.00$ MPa, $\theta_{xs1} = 31.7°$

8.5-21. (a) Mohr's circle, (b) $\sigma_1 = 16.06$ MPa, $\sigma_2 = -56.1$ MPa, $\theta_{xp1} = -28.2°$, (c) $\tau_{max} = 36.1$ MPa, $\sigma_{s1} = \sigma_{s2} = -20.0$ MPa, $\theta_{xs1} = -73.2°$

8.5-23. (a) Mohr's circle, (b) $\sigma_1 = 6.80$ ksi, $\sigma_2 = -3.20$ ksi, $\theta_{xp1} = -26.6°$, (c) $\tau_{max} = 5.00$ ksi, $\sigma_{s1} = \sigma_{s2} = 1.800$ ksi, $\theta_{xs1} = -71.6°$

8.5-25. $\sigma_{y'} = 0$, $\theta = 45°$

8.5-27. $(\sigma_0)_{max} = (\sigma_0)_\tau = 150.1$ psi

8.5-29. $P = 12.00$ kN

8.5-31. $M = 32.0$ kip·in.

8.5-33. (a) $\tau = 8.31$ ksi, (b) $\sigma_1 = 23.0$ ksi, $\sigma_2 = -3.00$ ksi, $\theta_{xp1} = 19.86°$

8.5-35. For Prob. 8.3-1: $\sigma_n = 32.0$ ksi, $\tau_{nt} = 22.0$ ksi

Use the MDSolids "Mohr's Circle" option to check your 3-D maximum-shear-stress solutions. Check the "Show Absolute Maximum Shear Stress" box.

8.6-1. (a) Mohr's circles, (b) $\tau_{max}^{abs} = 6.50$ ksi

8.6-3. (a) Mohr's circles, (b) $\tau_{max}^{abs} = 6.83$ ksi

8.6-5. (a) Mohr's circles, (b) $\tau_{max}^{abs} = 50.0$ MPa

8.6-7. (a) Mohr's circles, (b) $\tau_{max}^{abs} = 38.0$ MPa

8.6-9. (a) Mohr's circles, (b) $\tau_{max}^{abs} = 22.0$ ksi

8.6-11. (a) Mohr's circles, (b) $\tau_{max}^{abs} = 25.0$ MPa

8.6-13. Use the MDSolids "Mohr's Circle" option to obtain these 3-D maximum-shear-stress solutions. Check the "Show Absolute Maximum Shear Stress" box.

8.8-1. $\epsilon_n(\epsilon_y, \theta) = \epsilon_y \sin^2\theta$, $\gamma_{nt}(\epsilon_y, \theta) = 2\epsilon_y \sin\theta\cos\theta$

8.8-3. $\epsilon_n = \epsilon_x \cos^2\theta + \epsilon_y \sin^2\theta + \gamma_{xy} \sin\theta\cos\theta$

8.8-5. $\gamma_{max} = 2R = 2\sqrt{\left(\frac{\epsilon_x - \epsilon_y}{2}\right)^2 + \left(\frac{\gamma_{xy}}{2}\right)^2}$

8.8-7. (a) $\epsilon_x = -125.0\ \mu$, $\epsilon_y = 37.5\ \mu$, (b) $\epsilon_n = \epsilon_t = -43.8\ \mu$ (c) $\gamma_{nt} = 162.5\ \mu$

8.8-9. (a) $\gamma_{xy} = 2840\ \mu$, (b) $\epsilon_n = 1230\ \mu$, $\epsilon_t = -1230\ \mu$

8.8-11. (a) $\epsilon_x = 100\ \mu$, $\epsilon_y = 500\ \mu$, (b) $\gamma_{nt} = 346\ \mu$ (c) $\nu = 0.33$

8.9-1. (a) $\epsilon_n = 164.9\ \mu$, $\epsilon_t = -64.9\ \mu$, $\gamma_{nt} = -192.8\ \mu$ (b) ———, (c) ———

8.9-3. (a) $\epsilon_n = 607\ \mu$, $\epsilon_t = 443\ \mu$, $\gamma_{nt} = 615\ \mu$, (b) ———, (c) ———

8.9-5. (a) $\epsilon_n = 85.0\ \mu$, $\epsilon_t = -35.0\ \mu$, $\gamma_{nt} = -50.0\ \mu$, (b) ———, (c) ———

8.9-7. (a) $\epsilon_x = 133.3\ \mu$, $\epsilon_y = -40.0\ \mu$, (b) $\epsilon_n = 90.0\ \mu$, $\epsilon_t = 3.33\ \mu$, (c) $\gamma_{nt} = 150.1\ \mu$

8.9-9. $E = 10(10^3)$ ksi, $\nu = \frac{1}{3}$

8.9-11. (a) $\epsilon_x = 545\ \mu$, $\gamma_{xy} = 1420\ \mu$, (b) $\epsilon_n = 983\ \mu$, $\epsilon_t = -603\ \mu$

8.9-13. (a) $\epsilon_1 = 461\ \mu$, $\epsilon_2 = -261\ \mu$, $\theta_{xp1} = 16.85°$ cw (b) $\gamma_{max} = 721\ \mu$

8.9-15. (a) $\epsilon_1 = 150\ \mu$, $\epsilon_2 = -450\ \mu$, $\theta_{xp1} = 18.44°$ ccw (b) $\gamma_{max} = 500\ \mu$

8.9-17. (a) $\epsilon_1 = 230\ \mu$, $\epsilon_2 = -30\ \mu$, $\theta_{yp1} = 11.31°$ cw (b) $\gamma_{max} = 260\ \mu$

8.9-19. $\gamma_{xy} = 240\ \mu$, $\epsilon_2 = 30\ \mu$, $\theta_{xp1} = 63.4°$ ccw

8.9-21. The principal-stress axes and the principal-strain axes coincide.

8.9-23. The xy axes are principal-stress axes and principal-strain axes. The sign of a principal strain is not necessarily the same as the sign of the corresponding principal stress.

8.10-1. See Eqs. 8.51 and 8.52.

8.10-3. (a) $\epsilon_x = 175\ \mu$, $\epsilon_y = -105\ \mu$, $\gamma_{xy} = 210\ \mu$ (b) $\epsilon_1 = 210\ \mu$, $\epsilon_2 = -140\ \mu$, (c) $\theta_{xp1} = 18.43°$ ccw

8.10-5. (a) $\epsilon_x = -270\ \mu$, $\epsilon_y = 670\ \mu$, $\gamma_{xy} = 342\ \mu$ (b) $\epsilon_1 = 700\ \mu$, $\epsilon_2 = -300\ \mu$, $\gamma_{max} = 1000\ \mu$ (c) $\sigma_1 = 67.5$ MPa, $\sigma_2 = -7.75$ MPa, $\tau_{max} = 37.6$ MPa

8.10-7. (a) $\epsilon_x = -200\ \mu$, $\epsilon_y = 450\ \mu$, $\gamma_{xy} = 375\ \mu$, (b) $\epsilon_1 = 500\ \mu$, $\epsilon_2 = -250\ \mu$, (c) $\theta_{xp2} = 15°$ cw

8.10-9. (a) $\epsilon_x = \epsilon_a$, $\epsilon_y = \epsilon_b + \epsilon_c - \epsilon_a$, $\gamma_{xy} = \epsilon_b - \epsilon_c$

(b) $\epsilon_x = \epsilon_a$, $\epsilon_y = \frac{1}{3}(2\epsilon_b + 2\epsilon_c - \epsilon_a)$, $\gamma_{xy} = \frac{2}{\sqrt{3}}(\epsilon_c - \epsilon_b)$

8.10-11. (a) $\epsilon_x = 700\ \mu$, $\epsilon_y = -420\ \mu$, $\gamma_{xy} = -840\ \mu$, (b) $\sigma_x = 18.92$ ksi, $\sigma_y = -6.92$ ksi, $\tau_{xy} = -9.69$ ksi, (c) $\epsilon_1 = 840\ \mu$, $\epsilon_2 = -560\ \mu$, $\gamma_{max} = 1400\ \mu$, (d) ———

8.10-13. (a) $\epsilon_x = 592\ \mu$, $\epsilon_y = 0$, $\gamma_{xy} = 1367\ \mu$, (b) $\sigma_x = 46.5$ MPa, $\sigma_y = 15.35$ MPa, $\tau_{xy} = 36.0$ MPa, (c) $\epsilon_1 = 1041\ \mu$, $\epsilon_2 = -449\ \mu$, $\gamma_{max} = 1490\ \mu$, (d) ———

8.10-15. $T = \left[\frac{\pi E(r_0^4 - r_i^4)}{4(1+\nu)r_0}\right]\epsilon_t$

CHAPTER 9

9.2-1. (a) $\sigma_a = 8.00$ ksi, $\sigma_h = 16.00$ ksi (b) $f = 4.00$ kips/in.

9.2-3. (a) $\sigma_a = 28.1$ MPa, $\sigma_h = 56.2$ MPa (b) $f = 112.5$ kN/m, (c) $\tau_{max}^{abs} = 28.1$ MPa

9.2-5. (a) $\sigma_1 = \sigma_h = 118.5$ MPa, $\sigma_2 = \sigma_a = 59.2$ MPa, $\sigma_3 = \sigma_r = 0$ $(\tau_{max})_{in\text{-}plane} = 29.6$ MPa, (b) $\tau_{max}^{abs} = 59.2$ MPa

9.2-7. (a) $\sigma_a = 25.0$ MPa, $\sigma_h = 50.0$ MPa, (b) $\sigma_n = 29.5$ MPa, $\sigma_t = 45.5$ MPa, $\tau_{nt} = -9.58$ MPa, (c) $(\tau_{max})_{in\text{-}plane} = 12.5$ MPa, (d) $\tau_{max}^{abs} = 25.0$ MPa