

Missing Answers to Homework problems

1-7 $m_{\max} = 1.6 \text{ kg}$

1-9 $d_{\min} = 1/8 \text{ in.}$

1-13 $P = 88.3 \text{ kips}$

1-18 $\sigma = 0.505\gamma h \text{ (C)}$

1-20 $P_{\min} = 288 \text{ lbs.}$

1-26 $\tau = 15.3 \text{ ksi}$

1-36 $\sigma_{\text{bolt}} = 30.56 \text{ ksi (T)} \quad \tau = 5.09 \text{ ksi} \quad \sigma_{\text{bear}} = 3.82 \text{ ksi (C)} \quad \tau_{\text{wood}} = 1.27 \text{ ksi}$

1-44

$\sigma_{\text{FG}} = 22 \text{ MPa (C)} \quad \sigma_{\text{FC}} = 12 \text{ MPa (C)} \quad \sigma_{\text{FD}} = 12 \text{ MPa (T)} \quad \sigma_{\text{FE}} = 34 \text{ MPa (C)}$

1-45 $(\tau_{\text{F}})_{\max} = 48.1 \text{ MPa}$

1-48 $\sigma_{\text{AB}} = 1524 \text{ psi (T)} \quad \tau_{\text{C}} = 7763 \text{ psi}$

1-55 $w = 666.67 \text{ N/m} \quad \tau = 833 \text{ kPa}$

1-70 $n_{\max} = 11 \quad r = 2.31 \text{ in.}$

2-3 $\epsilon = 0.8401 \text{ in/in}$

2-26 $\gamma_{\text{A}} = -2714 \mu \text{ rad}$

2-32 $\gamma_{\text{A}} = -1144 \mu \text{ rad}$

2-41 $\delta_{\text{AP}} = 0.01 \text{ in extension} \quad \delta_{\text{BP}} = 0.0091 \text{ in extension}$

2-53 $\epsilon_{\text{xx}} = -1500 \mu \frac{\text{mm}}{\text{mm}} \quad \epsilon_{\text{yy}} = -2000 \mu \frac{\text{mm}}{\text{mm}} \quad \gamma_{\text{xy}} = 7000 \mu \text{ rad}$

2-56 $\epsilon_{\text{xx}} = 1500 \mu \frac{\text{mm}}{\text{mm}} \quad \epsilon_{\text{yy}} = -1375 \mu \frac{\text{mm}}{\text{mm}} \quad \gamma_{\text{xy}} = -2625 \mu \text{ rad}$

2-62 $u(L) - u(0) = 0.5493 \text{ KL}$

3-12 $E = 25,000 \text{ ksi} \quad \sigma_{\text{prop}} = 50 \text{ ksi}$

3-15 $\sigma_{\text{yield}} = 54 \text{ ksi}$

3-18 $E = 24893 \text{ ksi} \quad \sigma_{\text{prop}} = 36.9 \text{ ksi} \quad \sigma_{\text{yield}} = 37.5 \text{ ksi}$

$E_{\text{t}} = 400 \text{ ksi} \quad E_{\text{s}} = 1428.6 \text{ ksi} \quad \epsilon_{\text{plas}} = 0.015$

3-25 0.05 percent

3-39 $F = 10.3 \text{ kN}$

3-41 $F = 27.34 \text{ kN}$

3-46 $F = 136 \text{ kips}$

3-66 (a) $\sigma_{\text{zz}} = 0 \quad \epsilon_{\text{xx}} = -483 \mu \quad \epsilon_{\text{yy}} = -613 \mu \quad \gamma_{\text{xy}} = -1300 \mu \quad \epsilon_{\text{zz}} = 470 \mu$

(b) $\sigma_{\text{zz}} = 14.1 \text{ ksi (C)} \quad \epsilon_{\text{xx}} = -342 \mu \quad \epsilon_{\text{yy}} = -472 \mu \quad \gamma_{\text{xy}} = -1300 \mu \quad \epsilon_{\text{zz}} = 0$

3-70

$\sigma_{\text{zz}} = 0 \quad \sigma_{\text{xx}} = 139.93 \text{ MPa (T)} \quad \sigma_{\text{yy}} = 124.78 \text{ MPa (T)} \quad \tau_{\text{xy}} = -22.7 \text{ MPa} \quad \epsilon_{\text{zz}} = -423 \mu$

3-105 $W_{\max} = 12.1 \text{ kN}$

4-1 $F_1 = 7.5 \text{ kips} \quad F_2 = 11.25 \text{ kips} \quad F_3 = 8.75 \text{ kips} \quad F_4 = 5 \text{ kips}$

4-9 $N_{\text{AB}} = -1.5 \text{ kips} \quad N_{\text{BC}} = -5.5 \text{ kips} \quad N_{\text{CD}} = 2.5 \text{ kips}$

4-13 $u_{\text{B}} = 0.14 \text{ in}$

$$4-16 \quad u_C - u_A = -0.017 \text{ in} \quad \Delta d_{\max} = 0.00028 \text{ in}$$

$$4-22 \quad u_B = -(\gamma L^2)/(2E)$$

$$4-29 \quad d_{\min} = 3 \text{ mm} \quad \delta = 0.069 \text{ mm}$$

$$5-10 \quad T = 104.65 \text{ in-kips}$$

$$5-13 \quad T = -1050 \text{ N-m}$$

$$5-26 \quad \phi_D = 0.0109 \text{ rads CCW} \quad (\tau_{x\theta})_E = -30.2 \text{ MPa}$$

$$6-10 \quad M_z = -1.06 \text{ in-kips}$$

$$6-12 \quad M_z = 92.25 \text{ kN-m}$$

$$6-22 \quad \sigma_{\max} = 39.0 \text{ ksi(C)} \quad M_z = -54.5 \text{ in-kips}$$

$$6-24 \quad \sigma_A = 346 \text{ MPa(C)} \quad \sigma_B = 247 \text{ MPa(C)} \quad \sigma_D = 346 \text{ MPa(T)}$$

$$6-48 \quad P = 4.59 \text{ kips}$$

$$6-56 \quad V_y = -wL \text{ kips} \quad M_z = \left(wLx - \frac{3}{2}wL^2 \right) \text{ in-kips} \quad 0 \leq x < L$$

$$6-56 \quad V_y = [w(x-L) - wL] \text{ kips} \quad M_z = \left[wLx - \frac{w}{2}(x-L)^2 - \frac{3}{2}wL^2 \right] \text{ in-kips} \quad L < x \leq 2L$$

$$6-60 \quad V_y = (6x - 38) \text{ kN} \quad M_z = (-3x^2 + 38x - 82) \text{ kN-m} \quad 5\text{m} < x < 9\text{m}$$

$$6-60 \quad V_y = 10 \text{ kN} \quad M_z = (107 - 10x) \text{ kN-m} \quad 9\text{m} < x < 12\text{m}$$

$$6-69 \quad (V_y)_{\max} = -18 \text{ kN} \quad (M_z)_{\max} = 38.33 \text{ kN-m}$$

$$6-80 \quad S_{10 \times 25.4}$$

$$6-93 \quad \text{Point A: zero shear stress} \quad \text{Point B: positive } \tau_{xz} \quad \text{Point C: zero shear stress} \quad \text{Point D: negative } \tau_{xz}$$

$$7-1 \quad v(x) = \frac{Px^2}{6EI}(x-3L) \quad v(L) = -\frac{PL^3}{3EI}$$

$$7-6 \quad v(x) = \frac{Px}{6EI}(x^2 - 3Lx + 3L^2) \quad v(L) = \frac{PL^3}{6EI}$$

$$7-12 \quad v(x) = \begin{cases} \frac{wLx^2}{12EI}(2x-9L) & 0 \leq x \leq L \\ \frac{w}{EI} \left(\frac{2Lx^3 - 9L^2x^2}{12} - \frac{w}{24EI}(x-L)^4 \right) & L \leq x \leq 2L \end{cases} \quad v(L) = \frac{-7wL^4}{12EI}$$

$$8-4 \quad \sigma_{nn} \Rightarrow \text{Can't Say} \quad \tau_{nt} \Rightarrow \text{positive}$$

$$8-11 \quad \sigma_{nn} = 5.0 \text{ ksi (T)} \quad \tau_{nt} = 8.66 \text{ ksi}$$

$$8-21 \quad \sigma_{nn} = 21.07 \text{ MPa(C)} \quad \tau_{nt} = 0.825 \text{ MPa}$$

$$8-40 \quad \sigma_A = 21.1 \text{ MPa(C)} \quad \tau_A = 0.83 \text{ MPa}$$

$$8-41 \quad \sigma_A = 21.1 \text{ MPa(C)} \quad \tau_A = 0.83 \text{ MPa}$$

$$8-50 \quad \sigma_1 = 32.4 \text{ ksi(C)} \quad \sigma_2 = 44.8 \text{ ksi(C)} \quad \theta_1 = -34.10^\circ \text{ or } 145.9^\circ \quad \tau_{\max} = 22.4 \text{ ksi}$$

$$8-53 \quad \sigma_{xx} = 3.36 \text{ ksi(T)} \quad \sigma_{yy} = 1.64 \text{ ksi(T)} \quad \tau_{xy} = 2.35 \text{ ksi}$$

$$9-36 \quad \epsilon_1 = 1404.4\mu \quad \epsilon_2 = -304.4\mu \quad \epsilon_3 = 0 \quad \theta_1 = 55.3^\circ \text{ or } -124.7^\circ \quad \gamma_{\max} = 1708.8\mu$$

$$\epsilon_{nn} = 130\mu \quad \epsilon_{tt} = 970\mu \quad \gamma_{nt} = -1488\mu$$

$$9-51 \quad \theta_1 = -52^\circ \text{ or } 128^\circ \quad \epsilon_1 = 504\mu \quad \epsilon_2 = -1255\mu \quad \epsilon_3 = 0 \quad \gamma_{\max} = 1759\mu$$

- 9-62 $\sigma_{xx} = 117.3\text{MPa}$ $\sigma_{yy} = 149.3\text{MPa}$ $\tau_{xy} = 128.6\text{MPa}$
- 9-66 $\sigma_1 = 6.67\text{ksi(T)}$ $\sigma_2 = 6.67\text{ksi(T)}$ $\sigma_3 = 0$ $\theta_1 = \text{all directions}$ $\tau_{\max} = 3.34\text{ksi}$
- 9-70 $T = 837.4 \text{ N}\cdot\text{m}$
- 9-72 $\varepsilon_a = -171\mu$ $\varepsilon_b = 9246\mu$
- 10-2 $\sigma_{nn} = 29.11\text{ksi(T)}$ $\tau_{nt} = -0.557\text{ksi}$
- 10-5 $T = 6.39\text{kN}\cdot\text{m}$
- 10-40 $P_{\max} = 4.3\text{kN}$
- 10-43 $\sigma_{AB} = 6.9\text{ksi(T)}$ $\sigma_{CD} = 33.05\text{ksi}$
- 11-22 $P_{\text{cr1}} = \frac{20.19EI}{L^2}$ $P_{\text{cr2}} = \frac{59.68\pi^2 EI}{L^2}$