6.5-7. $\sigma_s = -\dfrac{E_s y}{\rho}$, $\sigma_w = -\dfrac{E_w y}{\rho}$, where
$\dfrac{1}{\rho} = \dfrac{12M}{E_w(b + 2nt_s)h^3}$

6.5-9. (a) $(\sigma_n)_{\max} = -25.9$ MPa, $(\sigma_c)_{\max} = 19.45$ MPa, (b) $\rho = 21.0$ m

6.5-11. (a) $(\sigma_w)_{\max} = -0.821$ ksi, $(\sigma_s)_{\max} = 10.10$ ksi, (b) $\rho = 969$ ft

6.5-13. (a) $\sigma_w = -\dfrac{My}{I_t}$, $\sigma_s = -\dfrac{nMy}{I_t}$, $I_t = \dfrac{(b+2nt_s)h^3}{12}$,
(b) $(\sigma_w)_{\max} = 531$ psi, $(\sigma_s)_{\max} = 10.62$ ksi

6.5-15. See Prob. 6.5-5.

6.5-17. $P_{\text{allow}} = (P_{\text{allow}})_w = 11.16$ kN

6.5-19. $w_{\text{allow}} = (w_{\text{allow}})_w = 6.22$ kN/m

6.5-21. $w = 3.24$ in.

6.6-1. $\sigma_A = 896$ psi, $\sigma_B = 418$ psi, $\sigma_D = -896$ psi, $\sigma_E = -418$ psi

6.6-3. (a) $\beta = 27.9^\circ$, (b) $M_{\text{allow}} = 1.441$ kN·m

6.6-5. $\beta = 13.73^\circ$ for $\theta = 2^\circ$,
(b) $(\sigma_x)_{\max T} = 2.69$ ksi for $\theta = 2^\circ$

6.6-7. (a) $I_{y'z'} = 3.27$ in^4, (c) $\sigma_{\max T} = 6.18$ ksi

6.6-9. (a) $I_{y'} = 6.42\,(10^6)$ mm^4, $I_{y'z'} = 6.17\,(10^6)$ mm^4,
(c) $\sigma_{\max T} = 28.1$ MPa, $\sigma_{\max C} = -35.0$ MPa

6.6-11. (b) $\sigma_{\max T} = 63.2$ MPa, $\sigma_{\max C} = -57.0$ MPa

6.6-13. (a) $\beta = 18.36^\circ$, (b) $\sigma_{\max} = 0.0916\left(\dfrac{M}{a^3}\right)$
for $\theta = 4^\circ$

6.6-15. $M_{\max} = 29.1$ kip·in.

6.6-17. (a) $\beta = -75.5^\circ$, (b) $\sigma_{\max} = 6.18$ ksi

6.7-1. (a) $M_Y = 24.0$ kip·in., $M_P = 36.0$ kip·in., $f = 1.500$, (b) ——

6.7-3. $M_Y = 2250$ kip·in., $M_P = 2750$ kip·in., $f = 1.218$

6.7-5. $M_Y = 2740$ kip·in., $M_P = 3070$ kip·in., $f = 1.120$

6.7-7. $M_Y = 1768$ kip·in., $M_P = 1976$ kip·in., $f = 1.118$

6.7-9. $M_Y = 89.0$ kip·in., $M_P = 166.0$ kip·in., $f = 1.866$

6.7-11. $M_Y = \dfrac{\pi\sigma_Y d^3}{32}$, $M_P = \dfrac{\sigma_Y d^3}{6}$, $f = 1.698$

6.7-13. $M_F = 2890$ kip·in.

6.7-15. $M_F = 1862$ kip·in.

6.7-17. $(\sigma_{\text{resid}})_{\max} = \sigma_Y$

6.7-19. $(\sigma_{\text{resid}})_{\max} = \sigma_Y = 36$ ksi

6.7-21. (a) $M_{Y1} = \dfrac{\sigma_Y bh^2}{8}$, (b) $M_{Y2} = \dfrac{19\sigma_Y bh^2}{96}$,
(c) $M_P = \dfrac{\sigma_Y bh^2}{4}$

6.8-1. $V_{\max} = 5.13$ kips

6.8-3. $\sigma_A = 0$, $\tau_A = 469$ kPa, $\sigma_B = -10.42$ MPa, $\tau_B = 417$ kPa, $\sigma_C = -20.8$ MPa, $\tau_C = 260$ kPa

6.8-5. (a) $P_\sigma = \dfrac{2bh^2\sigma_{\text{allow}}}{3L}$, (b) $P_\tau = \dfrac{4bh\tau_{\text{allow}}}{3}$

6.8-7. (a) $\sigma_{\max} = 14.76$ MPa, (b) $\tau_{\max} = 554$ kPa

6.8-9. (a) $\sigma_{\max} = 10.20$ ksi, (b) $\tau_{\max} = 351$ psi

6.8-11. (a) $\tau_{\max} = \dfrac{16V}{3\pi d^2}$, (b) $L_{\max} = \dfrac{3\pi d^2\tau_{\text{allow}}}{8w}$

6.8-13. (a) Use MDSolids to plot $V(x)$ and $M(x)$. (b) $\tau_{\max} = 254$ psi, (c) $\sigma_{\max} = 16.23$ ksi

6.10-1. (a) $I = 213$ in^4, (b) $(\tau_w)_{\max} = 14.34$ ksi, (c) $(\tau_w)_{\min} = 11.10$ ksi, (d) $V_w = 38.9$ kips. Therefore, the web carries 97.4% of the vertical shear force.

6.10-3. (a) $I = 2700$ in^4, (b) $(\tau_w)_{\max} = 14.46$ ksi, (c) $(\tau_w)_{\min} = 10.69$ ksi, (d) $V_w = 153.5$ kips. Therefore, the web carries 95.9% of the vertical shear force.

6.10-5. (a) $I = 227(10^6)$ mm^4, (b) $(\tau_w)_{\max} = 72.3$ MPa, (c) $(\tau_w)_{\min} = 59.9$ MPa, (d) $V_w = 205$ kN. Therefore, the web carries 93.3% of the vertical shear force.

6.10-7. $\dfrac{(\tau_{\max})_a}{(\tau_{\max})_b} = 0.873$

6.10-9. (a) $\tau_w(y) = V[2820\text{ m}^{-2} - 403(10^3)\text{ m}^{-4}(y^2)]$,
(b) $\dfrac{V_w}{V}\cdot(100\%) = 97.5\%$

6.10-11. $\tau_{\max} = 1.471$ ksi

6.10-13. $\dfrac{(\tau_{\max})_a}{(\tau_{\max})_b} = 0.635$

6.10-15. (a) $\bar{\eta} = 156.8$ mm, $I_C \equiv I_z = 213\,(10^6)$ mm^4,
(b) $\tau_A = 775$ kPa, $\tau_B = 617$ kPa, $\tau_C = 938$ kPa

6.10-17. $\sigma_{\max} = 26.7$ MPa, $\tau_{\max} = 23.0$ MPa

6.10-19. $\tau_{\max} = 6.71$ ksi

6.10-21. $(w_0)_{\max} = 128.0$ lb/ft

6.11-1. $(\tau_{\max})_{\text{glue}} = 213$ psi

6.11-3. The beam produced by Company A is 60% stronger in shear than the beam of Company B.

6.11-5. (a) $\tau_{\text{glue}} = 37.3$ psi, (b) $\tau_{\max} = 91.5$ psi

6.11-7. $V_{\text{allow}} = 1.285$ MN

6.11-9. $V_{\max} = 12.24$ kips

6.11-11. $(\Delta x)_{\max} = 105.1$ mm,

6.11-13. $(\Delta x)_{\max} = 2.63$ in.

6.11-15. $(\Delta x)_{AB} = 126.2$ mm, $(\Delta x)_{BC} = 101.0$ mm, $(\Delta x)_{CD} = 168.3$ mm

6.12-1. $e = 0.953$ in.

6.12-3. $e = 0.869$ in.

6.12-5. (a) $e = 0.868$ in., (b) $\tau_A = 2.63$ ksi, $\tau_B = 4.12$ ksi

6.12-7. $e = \dfrac{1544\,a}{549}$

6.12-9. $t_f = 0.1166$ in.

6.12-11. (a) $q_1(y) = \dfrac{3V}{4a^3}\left(\dfrac{9a^2 - y^2}{20 + 7\sqrt{2}}\right)$,
(b) $e = \dfrac{a}{2}\left(\dfrac{7 + 5\sqrt{2}}{20 + 7\sqrt{2}}\right)$

6.12-13. (a) $q(\theta) = \dfrac{V}{\pi r}(1 - \cos\theta)$, (b) $e = 2r$

6.12-15. (a) $q_f(s) = V(135.9\text{ m}^{-2})s$, (b) $e = 16.99$ mm