Chapter 1–5 formulas

$$\sigma = \frac{P}{A} \qquad \nu = \frac{-\varepsilon_{transverse}}{\varepsilon_{long}} \qquad P_S = n\, A_B \tau_{allowable} N$$

$$\varepsilon = \frac{\Delta L}{L} = \frac{\delta}{L} \qquad \varepsilon_x = \frac{1}{E}(\sigma_x - \nu\sigma_y - \nu\sigma_z) \qquad P_P = d\, t\, \sigma_{P-allowable} N$$

$$E = \frac{\sigma}{\varepsilon} \qquad \varepsilon_y = \frac{1}{E}(\sigma_y - \nu\sigma_x - \nu\sigma_z) \qquad P_G = b\, t\, \sigma_{G-allowable}$$

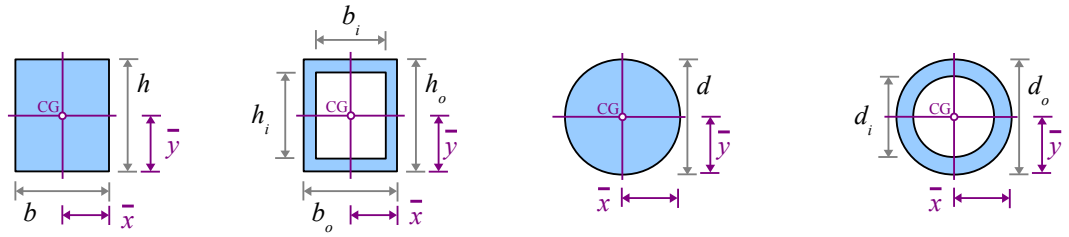
$$\delta = \frac{PL}{AE} \qquad \varepsilon_z = \frac{1}{E}(\sigma_z - \nu\sigma_x - \nu\sigma_y) \qquad P_N = (b\, t - N_F d_H t)\sigma_{N-allowable}$$

$$\tau = \frac{P}{A} \qquad \delta = \alpha\, L(\Delta T) \qquad \text{Joint efficiency} = \frac{P_{min.}}{P_G}$$

$$\gamma = \frac{\delta}{L} \qquad \sigma_{thermal} = -\alpha\, E(\Delta T) \qquad \sigma = K\, \sigma_{net}$$

$$G = \frac{\tau}{\gamma} \qquad \sigma_{hoop} = \frac{p\, d_i}{2t}\ ,\ \sigma_{long} = \frac{p\, d_i}{4\, t} \qquad A_{\text{circle}} = \frac{\pi}{4} d^2$$

Chapter 6–10 formulas



$\bar{x} = \frac{b}{2}\ ,\ \bar{y} = \frac{h}{2}$ $A = b\, h$ $I_x = \frac{b h^3}{12}\ ,\ I_y = \frac{h b^3}{12}$	$\bar{x} = \frac{b_o}{2}\ ,\ \bar{y} = \frac{h_o}{2}$ $A = b_o h_o - b_i h_i$ $I_x = \frac{b_o h_o^3 - b_i h_i^3}{12}$	$\bar{x} = \bar{y} = \frac{d}{2}$ $A = \frac{\pi d^2}{4}$ $I_x = I_y = \frac{\pi d^4}{64}\ ,\ J = \frac{\pi d^4}{32}$	$\bar{x} = \bar{y} = \frac{d_o}{2}$ $A = \frac{\pi(d_o^2 - d_i^2)}{4}$ $I_x = I_y = \frac{\pi(d_o^4 - d_i^4)}{64}\ ,\ J = \frac{\pi(d_o^4 - d_i^4)}{32}$

$$I_x = \sum_1^n a_i y_i^2 \qquad I_y = \sum_1^n a_i x_i^2 \qquad I = I_o + a d^2 \qquad \circlearrowleft \sum M_A = 0\ ,\ \uparrow + \sum F_y = 0$$

$$\bar{y} = \frac{\Sigma a\, y}{\Sigma a}$$

$$\tau = \frac{Tc}{J} \qquad \tau = K\frac{Tc}{J} \qquad \theta = \frac{TL}{JG} \qquad \theta = \frac{\tau L}{G c}$$

$$\sigma = \frac{Mc}{I_x} \qquad \sigma = \frac{M}{S_x} \qquad M_{allowable} = \frac{\sigma_{allowable} I_x}{c} \qquad M_{allowable} = \sigma_{allowable} S_x$$

$$\tau = \frac{V Q}{I t} \qquad Q = \bar{y} A' \qquad \tau = \frac{V}{d\, t_w} \qquad \tau_{allowable} = 0.4\, \sigma_{YS}$$

$$R = \frac{E I}{M} \qquad \sigma = \frac{E c}{R} \qquad \sigma = \frac{M}{Z_x} \qquad M_{allowable} = 0.6 \sigma_{YS} Z_x$$

Units

Giga, G–, 10^9

Mega, M–, 10^6

kilo, k–, 10^3

centi, c–, 10^{-2}

milli, m–, 10^{-3}

1 ft. = 12 inches

180 degrees = π radians

Pa = N/m^2

1 kip = 1000 lb.

Exam II problem topics

Moment of inertia of a compound shape

Torsion: shear stress

Torsion: angle of twist

Beam reactions, shear diagrams, & moment diagrams

Bending stress in beams

Shear stress in beams

Beam deflection