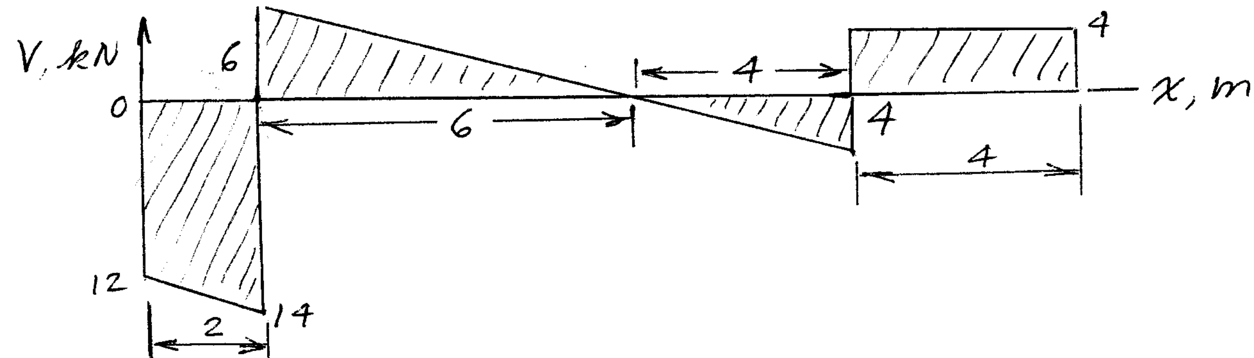
39.

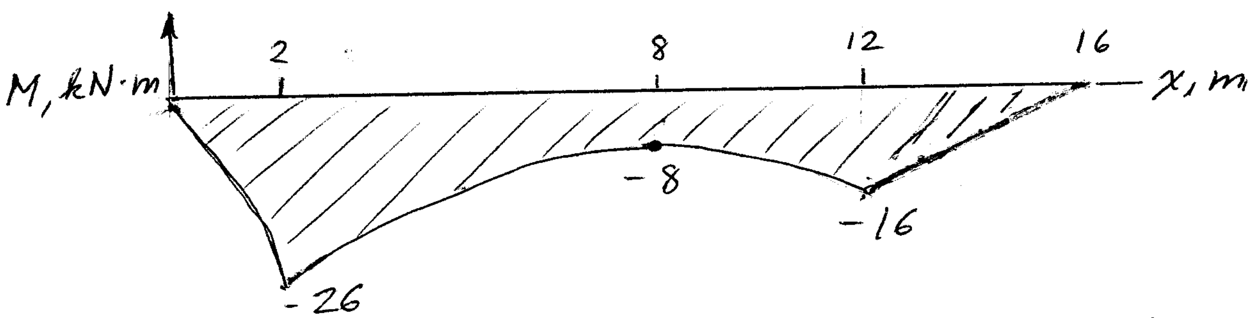
The slope of the line forming the triangles is 10 kN/10 m or 1 kN/m. So, the lengths of the triangle bases are:



At $x = 2\,m$, $M = -(13)(2) = -26\ kN\cdot m$

At $x = 8\,m$, $M = -26 + \frac{1}{2}(6)(6) = -8\ kN\cdot m$

At $x = 12\,m$, $M = -8 - \frac{1}{2}(4)(4) = -16\ kN\cdot m$



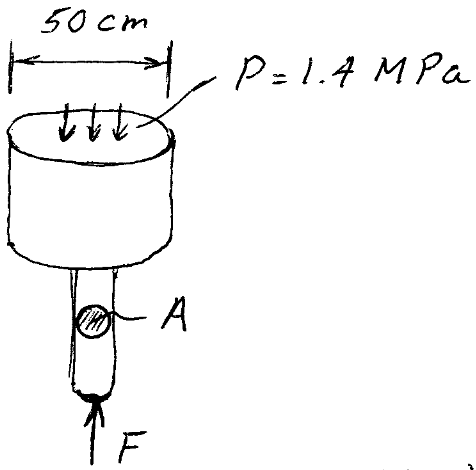
$|M|_{max} = 26\ kN\cdot m$ ← Ans.

40

$$\delta = \frac{PL}{AE} = \frac{(5000)(0.25)}{(0.00125)(200\times 10^9)} = 5\times 10^{-6}$$

$= 5\ \mu m$ ← Ans.

\#41



$$F = (1.4\times10^6)(\pi)\left(\frac{0.5}{2}\right)^2 \text{ N}$$

$$\sigma = \frac{F}{A}$$

$$A = \frac{(1.4\times\cancel{10^6})(\pi)\left(\frac{0.5}{2}\right)^2}{68\times\cancel{10^6}}$$

$$= 4.04\times10^{-3}\ m^2 \longleftarrow \text{Ans.}$$

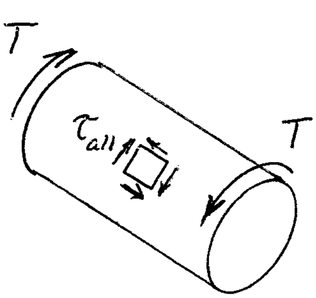
\#42

$$\tau = \frac{Tr}{J}$$

$$\tau = \frac{(1000)\left(\frac{0.075}{2}\right)}{\frac{1}{2}\pi\left[\left(\frac{0.075}{2}\right)^4 - \left(\frac{0.050}{2}\right)^4\right]}$$

$$= 15.04 \text{ MPa} \longleftarrow \text{Ans.}$$

\#43



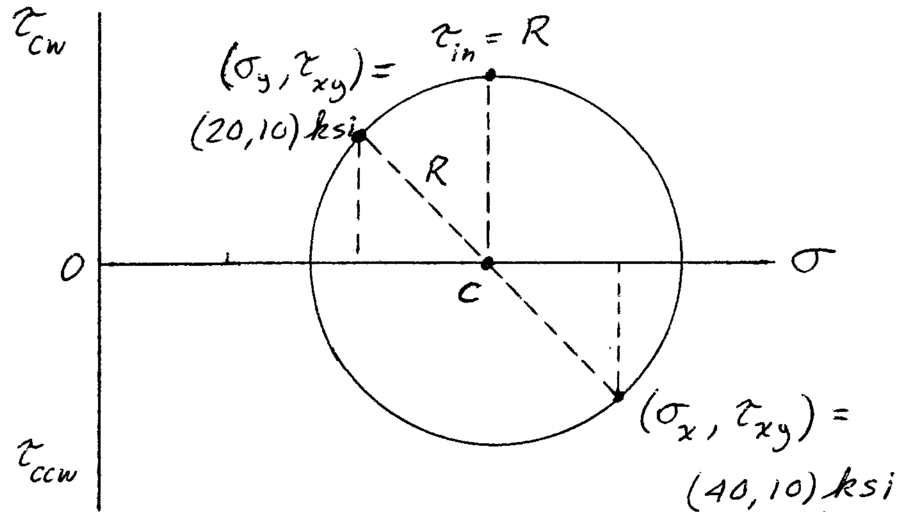
$$\tau_{all} = \frac{Tr}{J}$$

$$T = \frac{\tau_{all} J}{r}$$

$$= \frac{(840\times10^3)\left(\frac{1}{2}\pi\left(\frac{0.2}{2}\right)^4\right)}{\frac{0.2}{2}}$$

$$= 1319 \text{ N}\cdot\text{m} \longleftarrow \text{Ans.}$$

#44

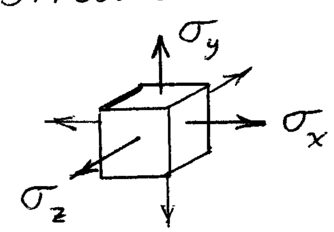


$$\tau_{in} = R = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$= \sqrt{\left(\frac{40-20}{2}\right)^2 + 10^2}$$

$$= \sqrt{200} = 14.14 \text{ ksi} \longleftarrow \text{Ans}$$

#45 Stresses at Point O:



$$\sigma_x = -\frac{10{,}000}{(0.1)(0.01)} = -10 \text{ MPa}$$

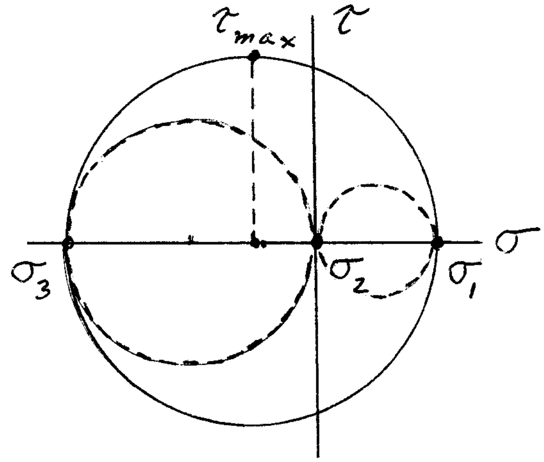
$$\sigma_y = \frac{5000}{(0.1)(0.01)} = 5 \text{ MPa}$$

$$\sigma_z = 0 \text{ MPa}$$

Principal stresses: $\sigma_1 = \sigma_y = 5$ MPa

$\sigma_2 = \sigma_z = 0$ MPa

$\sigma_3 = \sigma_x = -10$ MPa

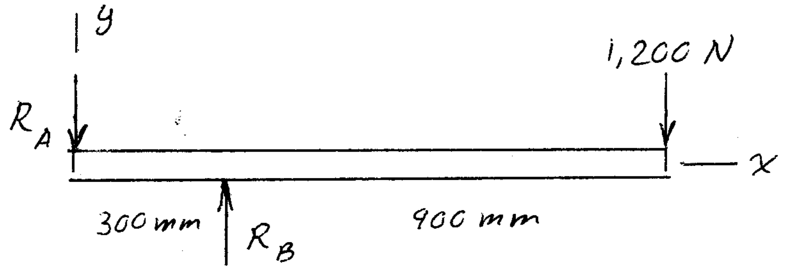


$$\tau_{max} = \frac{\sigma_1 - \sigma_3}{2} = \frac{5+10}{2}$$

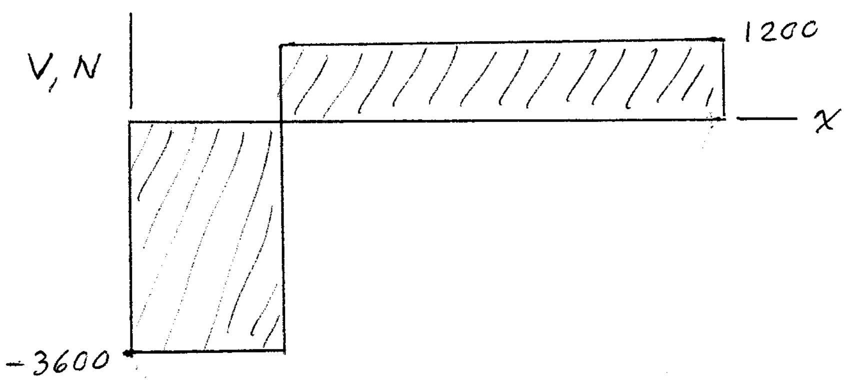
$$= 7.5 \text{ MPa} \longleftarrow \text{Ans.}$$

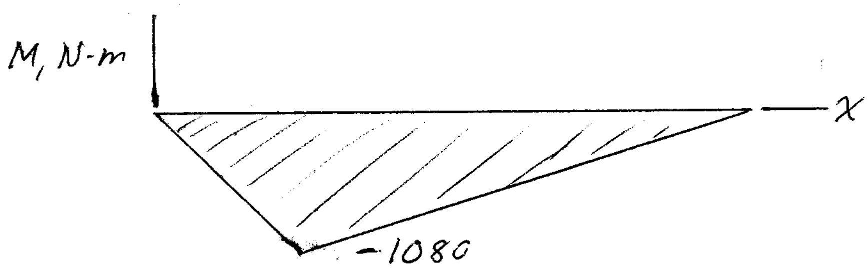
\#46 elastic buckling ← Ans.

\#93



$$\Sigma M_A = 0$$
$$0.3 R_B = (1200)(1.2)$$
$$R_B = 4800 \text{ N}$$
$$\Sigma F_y = 0$$
$$R_A = 4800 - 1200$$
$$R_A = 3600 \text{ N}$$



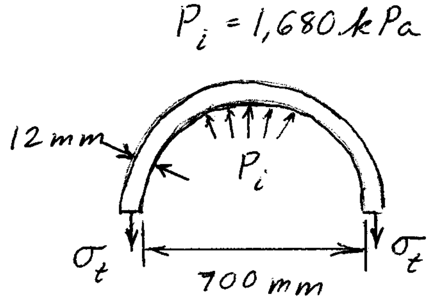


Top "fiber" is in tension.

$$\sigma = \frac{Mc}{I}$$
$$= \frac{(1080)(0.015)}{11 \times 10^4 \times 10^{-12}}$$
$$\sigma = 147 \text{ MPa} \longleftarrow \text{Ans.}$$

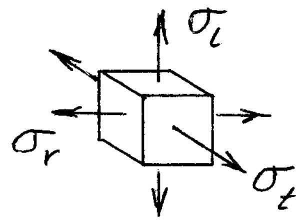
\#97

$P_i = 1,680 \text{ kPa}$



$$\frac{t}{r_i} = \frac{12}{350} = 0.034 < 0.1 \Longrightarrow \sigma_t = \frac{P_i r}{t}$$
$$r = \frac{r_i + r_o}{2}$$
$$\sigma_t = \frac{(1,680 \times 10^3)(0.356)}{0.012}$$
$$= 49.8 \text{ MPa} \longleftarrow \text{Ans}$$

98



$$\sigma_t = 46.2\ MPa$$
$$\sigma_l = 23.1\ MPa$$
$$\sigma_r = 0$$

$$\epsilon_l = \frac{1}{E}(\sigma_l - \nu\sigma_t)$$
$$= \frac{1}{210\times10^9}\left(23.1 - (0.24)(46.2)\right)10^6$$
$$= 57.2\times10^{-6}$$
$$\Delta L = \epsilon_l L = (57.2\times10^{-6})(1)$$
$$= 57.2\ \mu m = 0.0572\ mm \longleftarrow \text{Ans.}$$

99

$$\frac{t}{r_i} = \frac{2.5\,mm}{305\,mm} = 0.0082 < 0.1 \Longrightarrow \sigma_t = \frac{P_i r}{t}$$

$$r = \frac{r_i + r_o}{2} = 306.25\ mm$$

$$\sigma_t = \frac{(600\times1000)(0.30625)}{0.0025}$$
$$= 73.5\ MPa \longleftarrow \text{Ans.}$$