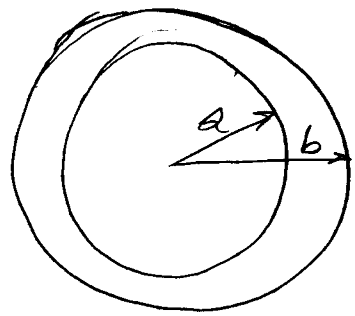
Given:



$a = 24 in$

$b = 30 in$

$p_i = 5{,}000 psi$

Find:

σ_θ , σ_r , τ_{max}

Solution:

$$\sigma_\theta = \frac{a^2 p_i}{b^2 - a^2}\left(1 + \frac{b^2}{r^2}\right)$$

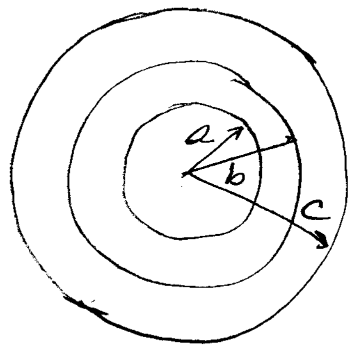
$$= \underline{\underline{22.8 \text{ ksi}}} \text{ at } r = a.$$

$$\sigma_r = \frac{a^2 p_i}{b^2 - a^2}\left(1 - \frac{b^2}{r^2}\right)$$

$$= \underline{\underline{-5.0 \text{ ksi}}} \text{ at } r = a.$$

$$\tau_{max} = \frac{\sigma_\theta - \sigma_r}{2} = \underline{\underline{13.9 \text{ ksi}}}$$

Given:



Compound Cylinder

$p_i = 32{,}000$ psi

$a = 10$ in.

$b = 12$ in.

$c = 13$ in.

$E = 30 \times 10^6$ psi

$\delta = 0.005$ in

Find: σ_θ at $r = a$.

Solution:

Find interface pressure:

$$p = \frac{E\delta}{b} \frac{(b^2 - a^2)(c^2 - b^2)}{2b^2(c^2 - a^2)}$$

$$p = 692 \text{ psi}$$

$$\sigma_\theta|_a = \frac{-b^2 p}{b^2 - a^2}\left(1 + \frac{a^2}{r^2}\right)$$

$$= -4{,}530 \text{ psi}$$

Internal Pressure Contribution

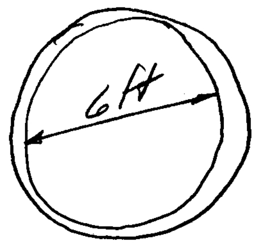
$$\sigma_\theta|_a = \frac{a^2 p_i}{c^2 - a^2}\left(1 + \frac{c^2}{a^2}\right)$$

$$= 125.\ ksi$$

Total Stress

$$\Rightarrow \sigma_\theta|_a = \underline{\underline{120 ksi}}$$

Given:



Thin Walled Cylinder

$p_i = 1\ ksi$

$\sigma_{\theta_{max}} = 20\ ksi$

Find: Required wall thickness.

Solution:

$$\sigma_\theta = \frac{pr}{t} \Rightarrow t = \frac{pr}{\sigma_{\theta max}} = \frac{(1\ ksi)(6\ ft)(12\ in/ft)}{(2)\ 20\ ksi}$$

$$\underline{\underline{t = 1.8\ in}}$$