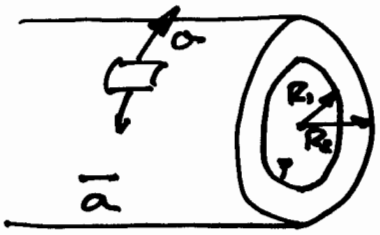
5.20



$$\sigma = \frac{2p R_1^2}{(R_2^2 - R_1^2)} \quad \begin{cases} R_1 = .1475\,m \\ R_2 = .1675\,m \end{cases}$$

(1) brittle fracture

$$\sigma_f = \frac{K_{IC}}{Y\sqrt{\pi a}} \quad \begin{cases} K_{IC} = 3.1e6\ Pa\sqrt{m} \\ Y = 1.12 \\ a = 100e\text{-}6\ m \end{cases}$$

$$\sigma_f = \frac{3.1e6}{1.12\sqrt{\pi\,(100e\text{-}6)}} = 156e6\ Pa$$

$\sigma_y = 40e6\ Pa$, $< \sigma_f$ → will fail by yielding

@ $\sigma = \sigma_y = 40e6 = \dfrac{2p\,(.1475^2)}{(.1675^2 - .1475^2)}$

$$\rightarrow p = 5.79e6\ Pa$$

(2) would have ductile (yielding) failure until σ_y rises above $\sigma_f = 156e6\ Pa$

(3) If $K_{IC} = 1.5e6\ Pa\sqrt{m}$

$$\sigma_f = 156e6\left(\frac{1.5}{3.1}\right) = 75.5e6\ Pa$$