

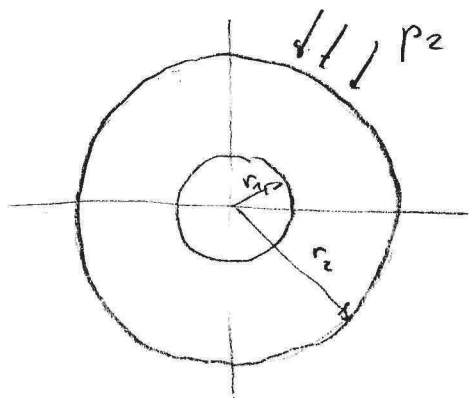
Pr: Určete bezpečnost k HS pružnosti a stlačením otvoru u tenkého disku podle obrázku.

mat.: E, ν, σ_R

der. podmínky: $\sigma_r|_{r=r_1} = 0$

$$\sigma_r|_{r=r_2} = -p_2$$

$$\sigma_z = 0 \quad (\text{vinná napjatost})$$



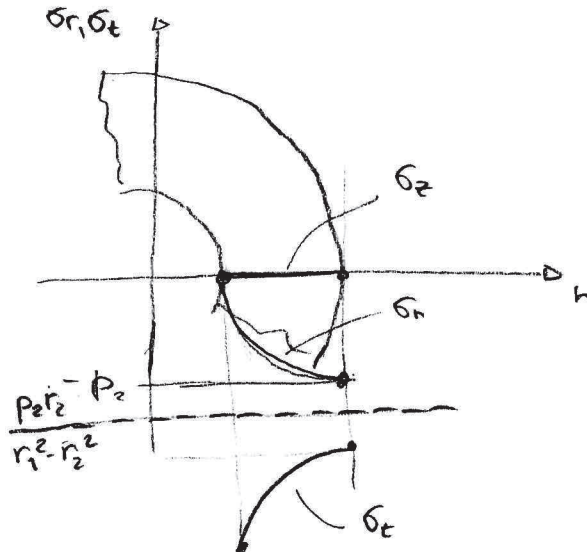
$$\sigma_r = A - \frac{B}{r^2} \Rightarrow A - \frac{B}{r_1^2} = 0, A - \frac{B}{r_2^2} = -p_2 \Rightarrow$$

$$\Rightarrow -\frac{B}{r_1^2} + \frac{B}{r_2^2} = p_2 \Rightarrow B = \frac{p_2}{-\frac{1}{r_1^2} + \frac{1}{r_2^2}} \Rightarrow B = \frac{p_2 r_1^2 r_2^2}{r_1^2 - r_2^2} \Rightarrow$$

$$\Rightarrow A = \frac{p_2 r_2^2}{r_1^2 - r_2^2}$$

$$\sigma_r = \frac{p_2 r_2^2}{r_1^2 - r_2^2} \left(1 - \frac{r_1^2}{r^2} \right)$$

$$\sigma_t = \frac{p_2 r_2^2}{r_1^2 - r_2^2} \left(1 + \frac{r_1^2}{r^2} \right)$$



$$\sigma_{\text{red}}^{\text{max}} = |\sigma_r - \sigma_t| \Big|_{r=r_1} = \frac{2 p_2 r_1^2 r_2^2}{r_2^2 - r_1^2}$$

$$k = \frac{\sigma_k}{\sigma_{\text{red}}}$$

$$u = \frac{(1+\nu)(1-2\nu)}{E} \cdot A \cdot r + \frac{1+\nu}{E} \frac{B}{r} \Rightarrow u(r=r_1) = \frac{p_2 r_2^2}{r_1^2 - r_2^2} \left[\frac{(1+\nu)(1-2\nu)}{E} \cdot r_1 + \frac{1+\nu}{E} \cdot \frac{r_1^3}{r_1} \right] = \frac{p_2 r_2^2 r_1}{r_1^2 - r_2^2} \frac{(1+\nu)(1-2\nu) + (1+\nu)}{E}$$