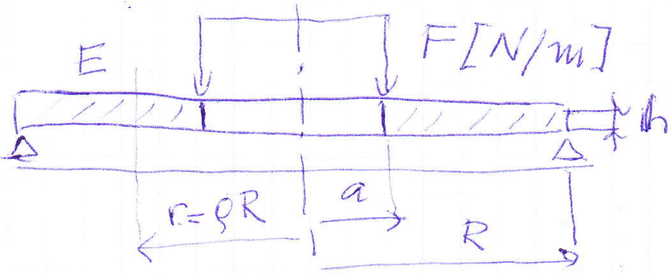
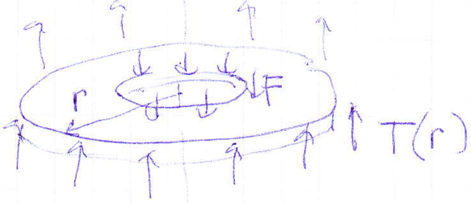
ŠKODA

ŠKODA VÝZKUM s.r.o.

Experimentální Analýza Napětí 2004

1. - 3. červen - Kašperské Hory





$$T(r)\cdot 2\pi r - F\cdot 2\pi a = 0$$

$$T(r) = F\cdot\frac{a}{r} = F\frac{a}{R}\cdot\frac{1}{\rho}$$

D: $a=\frac{R}{4}$, F, E, ν

$$P.S. = -R^2\cdot\frac{T(\rho)}{D} = -\frac{FaR}{D}\cdot\frac{1}{\rho}$$

$$\vartheta(\rho) = -\frac{FaR}{D}\cdot\left(C_1\rho + C_2\frac{1}{\rho} + \frac{1}{2}\rho\ln\rho\right)$$

$(r=a)\,(\rho=\frac{a}{R})$ $\quad M_r\left(\frac{a}{R}\right)=0$

$(r=R)\,(\rho=1)$ $\quad M_r(1)=1$

$$M_r = \frac{D}{R}\left(\frac{d\vartheta}{d\rho}+\nu\frac{\vartheta}{\rho}\right) \qquad M_t = \frac{D}{R}\left(\frac{\vartheta}{\rho}+\nu\frac{d\vartheta}{d\rho}\right)$$

$$M_r = -Fa\left(C_1(1+\nu) - C_2(1-\nu)\frac{1}{\rho^2} + \frac{1}{2}(\ln\rho+1) + \frac{\nu}{2}\ln\rho\right)$$

$$M_t = -Fa\left(C_1(1+\nu) + C_2(1-\nu)\frac{1}{\rho^2} + \frac{1}{2}\ln\rho + \frac{\nu}{2}(1+\ln\rho)\right)$$

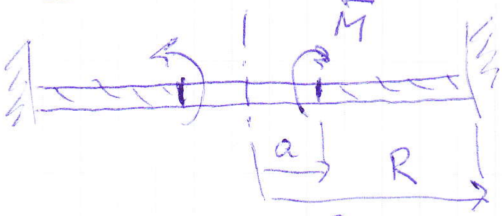
$M_r\left(\frac{a}{R}\right) = M_r\left(\frac{1}{4}\right) = 0 \qquad C_1(1+\nu) - C_2(1-\nu)\cdot 16 = -\frac{1}{2}(1+\nu)\ln\frac{1}{4} - \frac{1}{2}$

$M_r(R) = M_r(1) = 0 \qquad C_1(1+\nu) - C_2(1-\nu) = -\frac{1}{2}$

$\Rightarrow C_1, C_2$

$$w(\rho) = -R\int\vartheta(\rho)\,d\rho = \frac{FaR^2}{D}\left(C_1\frac{\rho^2}{2} + C_2\ln\rho + \frac{1}{2}\left(\frac{\rho^2}{2}\ln\rho - \frac{\rho^2}{4}\right) + C_3\right)$$

$w(1)=0 \qquad C_3 = -\frac{C_1}{2} + \frac{1}{8}$



$T=0 \qquad P.S.=0$

$$\vartheta(\rho) = \frac{\bar{M}R}{D}\left(C_1\rho + C_2\frac{1}{\rho}\right)$$

$\vartheta(1)=0 \qquad C_1+C_2=0$

$M_r\left(\frac{a}{R}\right)=\bar{M} \qquad \bar{M}\left(C_1(1+\nu) - C_2(1-\nu)\left(\frac{R}{a}\right)^2\right) = \bar{M}$

$\Rightarrow C_1, C_2$

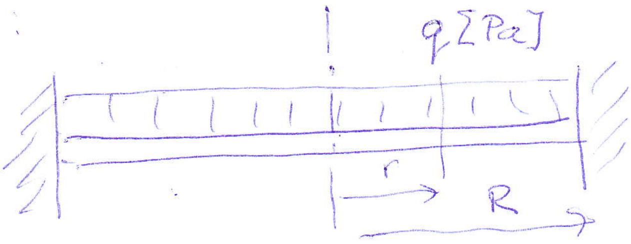
D: $\bar{M}$, R, $a=\frac{R}{2}$, E, ν

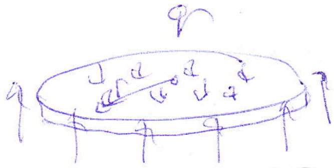
$$M_r = \bar{M}\left(C_1(1+\nu) - C_2(1-\nu)\frac{1}{\rho^2}\right)$$

$$M_t = \bar{M}\left(C_1(1+\nu) + C_2(1-\nu)\frac{1}{\rho^2}\right)$$

$$w(\rho) = -\frac{\bar{M}R^2}{D}\left(C_1\frac{\rho^2}{2} + C_2\ln\rho + C_3\right)$$

$w(1)=0 \qquad C_3 = -\frac{C_1}{2}$





$T(r)\,2\pi r - q\,\pi r^2 = 0$

$T(\rho) = \frac{qR}{2}\rho$

P.S. $= -\frac{qR^3}{2D}\rho$

$\vartheta(\rho) = -\frac{qR^3}{2D}\left(C_1\rho + C_2\frac{1}{\rho} + \frac{\rho^3}{8}\right)$

$\vartheta(0) = 0 \Rightarrow C_2 = 0$

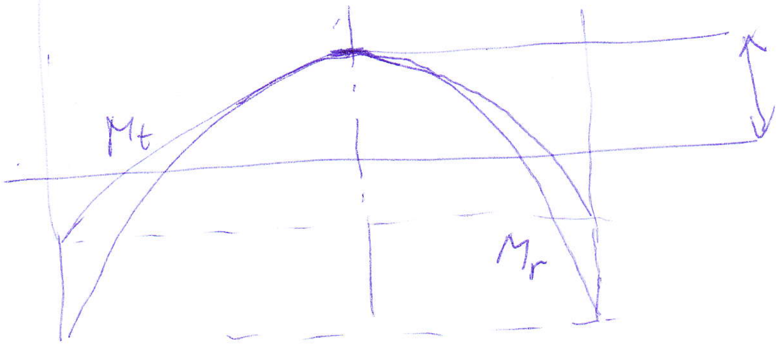
$\vartheta(1) = 0 \quad C_1 = -\frac{1}{8}$

$M_r(\rho) = -\frac{qR^2}{2}\left(C_1(1+\nu) + \frac{3+\nu}{8}\rho^2\right)$

$M_t(\rho) = -\frac{qR^2}{2}\left(C_1(1+\nu) + \frac{1+3\nu}{8}\rho^2\right)$

$w(\rho) = \frac{qR^4}{2D}\left(C_1\frac{\rho^2}{2} + \frac{\rho^4}{32} + C_3\right) \quad w(1) = 0$

$C_3 = -\frac{1}{2}C_1 - \frac{1}{32}$



$\frac{qR^2}{16}(1+\nu)$

$M_r(1) = \frac{qR^2}{16}(-2)$

$M_t(1) = \frac{qR^2}{16}(-2\nu)$

$\sigma_{eqv}(0) = \frac{\frac{qR^2}{16}(1+\nu)}{h^2/6} \qquad \sigma_{eqv}(1) = \frac{qR^2/16}{h^2/6}\sqrt{4+4\nu^2-4\nu^2}$