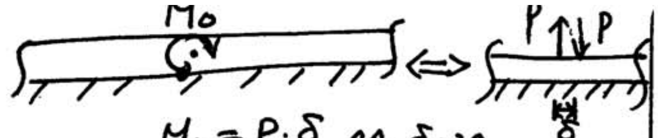
10.1 | 

$M_0 = P\cdot\delta$ as $\delta \to 0$.

$$\theta = -\frac{P\beta^2}{k} B_{\beta z}$$

$$V = -\frac{P}{2} D_{\beta z}$$

$$\theta = \frac{P\beta^2}{k} B_{\beta(z+\delta)} - \frac{P\beta^2}{k} B_{\beta z}$$

$$= \frac{P\delta\beta^2}{k}\left[\frac{B_{\beta(z+\delta)} - B_{\beta z}}{\delta}\right] = \frac{M_0\beta^2}{k}\underbrace{\frac{dB_{\beta z}}{dz}}_{\beta C_{\beta z}}$$

$$= \frac{M_0\beta^3}{k} C_{\beta z}$$

$$V = \frac{P}{2} D_{\beta(z+\delta)} - \frac{P}{2} D_{\beta z}$$

$$= \frac{P\cdot\delta}{2}\left[\frac{D_{\beta(z+\delta)} - D_{\beta z}}{\delta}\right] = \frac{P\cdot\delta}{2}\underbrace{\frac{dD_{\beta z}}{dz}}_{-\beta A_{\beta z}}$$

$$= -\frac{M_0\beta}{2} A_{\beta z}$$

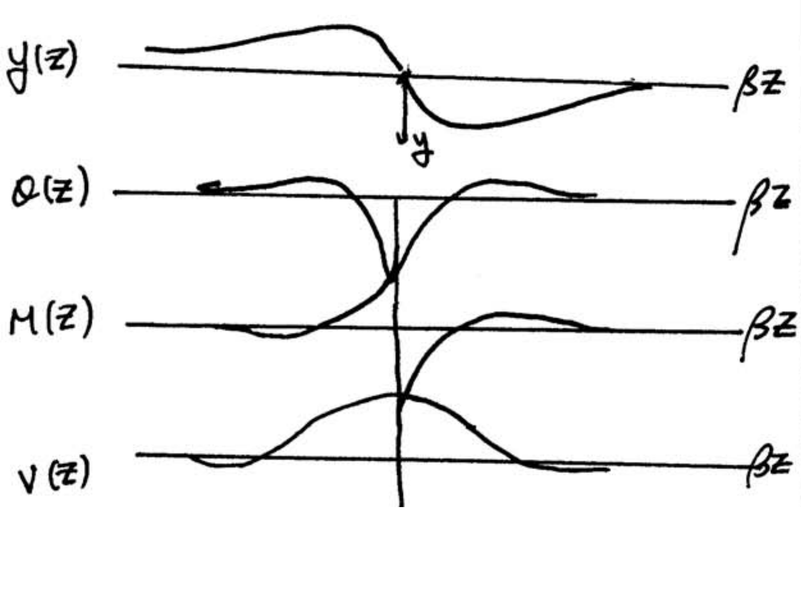
10.2c | When M_0 is applied.

$y(z) = +\frac{M_0\beta^2}{k} B_{\beta z}$ anti-sym

$\theta(z) = \frac{M_0\beta^3}{k} C_{\beta z}$ sym

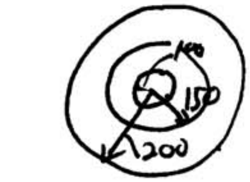
$M(z) = \frac{M_0}{2} D_{\beta z}$ anti-sym

$V(z) = -\frac{M_0\beta}{2} A_{\beta z}$ sym



11.10 | $E = 72$ GPa $\nu = 0.33$

$\delta = 0.125$ mm, $P_i = 200$ MPa



$a = 100$ mm
$b = 150$ mm
$c = 200$ mm

From pp.132

$$\delta = \frac{2b^3(c^2-a^2)}{(b^2-a^2)(c^2-b^2)}\frac{P}{E} \Rightarrow P = 9.722$$

Inner cyl. $P_i = 200$, $P_o = 9.722$

$$\sigma_{\theta\theta}\Big|_{in} = \frac{P_i a^2 - P_o b^2}{b^2-a^2} - \frac{a^2b^2(P_o - P_i)}{b^2-a^2}\frac{1}{b^2}$$

$$= 159.9 \text{ MPa}$$

Outer cyl.

$$\sigma^1_{\theta\theta} + \sigma^2_{\theta\theta} = \frac{b^2 P_s}{c^2-b^2}\left(1+\frac{c^2}{r^2}\right)\Big|_{r=b}$$

$$+ \frac{a^2 P_i}{c^2-a^2}\left(1+\frac{c^2}{r^2}\right)\Big|_{r=b}.$$

$$= 34.72 + 185.2$$

$$= 219.9 \text{ MPa}$$