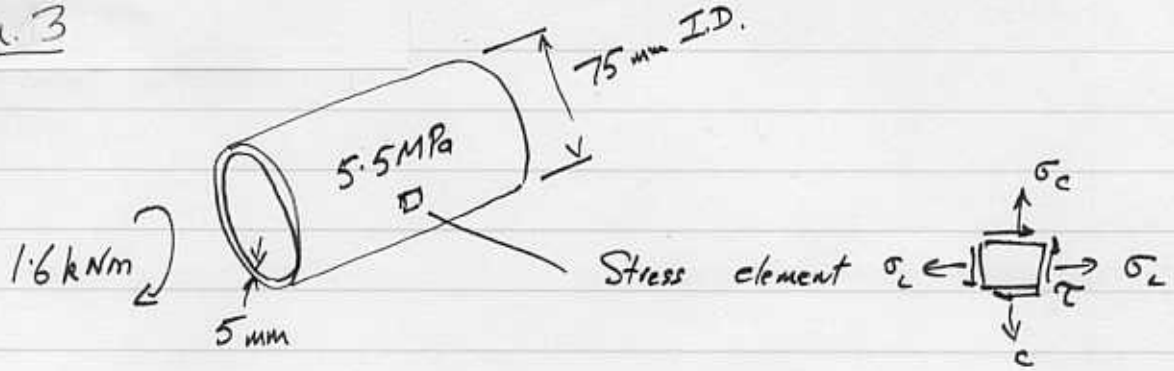
Qu. 3



$$\sigma_c = \frac{pD}{2t} = \frac{5.5\times10^6 \times 75\times10^{-3}}{2\times5\times10^{-3}} = \underline{41.25}\ MN/m^2$$

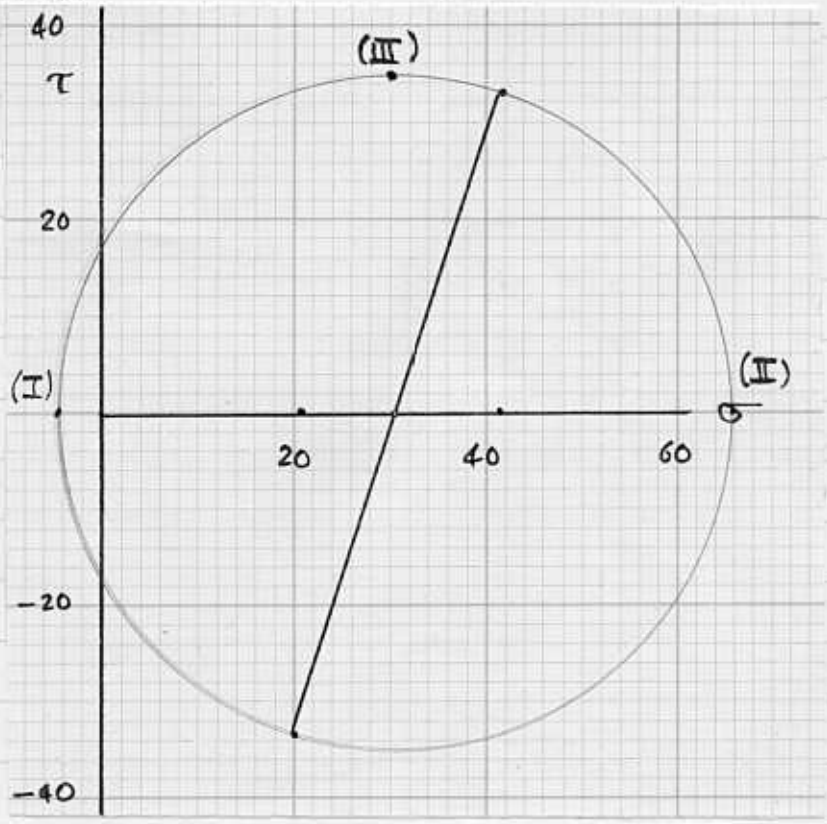
$$\sigma_L = \frac{pD}{4t} = \frac{\sigma_c}{2} = \underline{20.6}\ MN/m^2$$

Shear stress is given from: $\frac{T}{J} = \frac{\tau}{r}$ or $\tau = \frac{Tr}{J}$

$$J = \frac{\pi}{32}(D^4 - d^4) = \frac{\pi}{32}\left((85\times10^{-3})^4 - (75\times10^{-3})^4\right) = 2.018\times10^{-6}\ m^4$$

$$\therefore \tau = \frac{1.6\times10^3 \times \frac{85}{2}\times10^{-3}}{2.018\times10^{-6}} = \underline{33.69}\ MN/m^2$$

Draw Mohr's circle :-



whence

Principal stresses are
(I) $-2.5\ MN/m^2$ &
(II) $64.3\ MN/m^2$
max^m shear stress
(III) is $34.4\ MN/m^2$