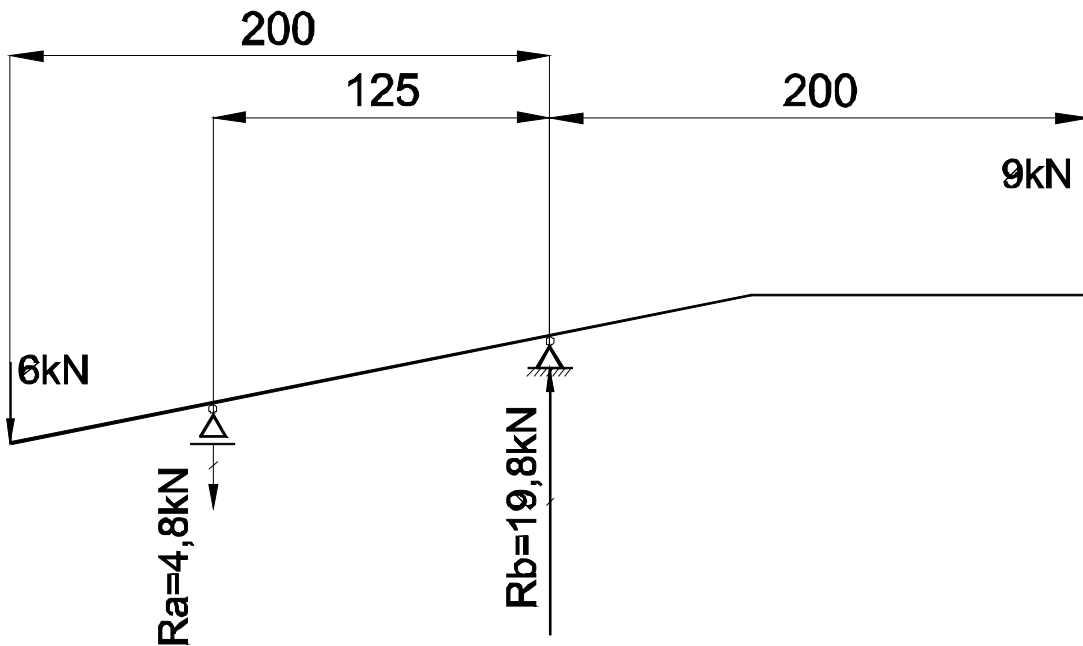


1ª Questão:

a) Reações de apoio.



$$\sum F_z = 0$$

$$-R_A + R_B = 15kN$$

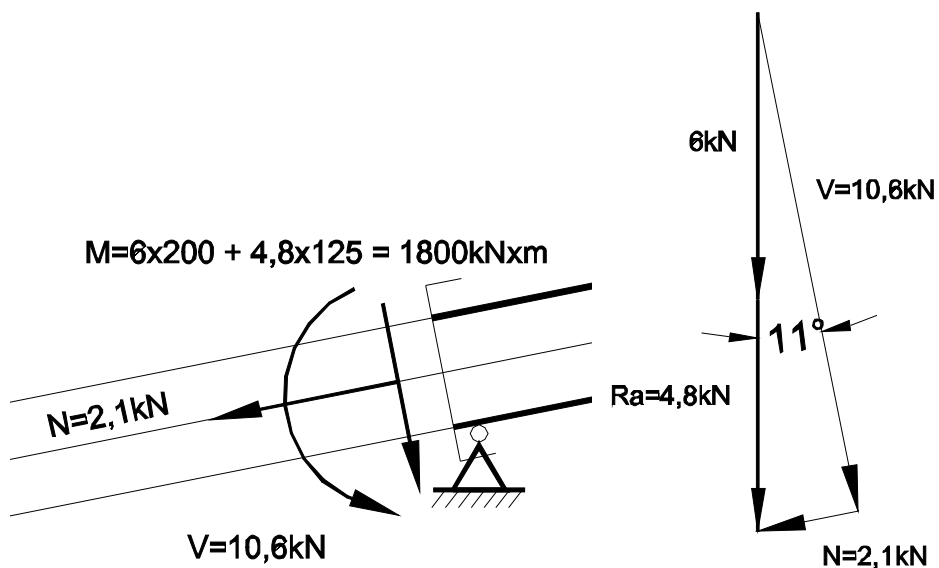
$$\sum M_B = 0$$

$$R_A \times 125 = (9 - 6) \times 200$$

$$R_A = 4,8kN$$

$$R_B = 15 + 4,8 = 19,8kN$$

Esforços solicitantes.

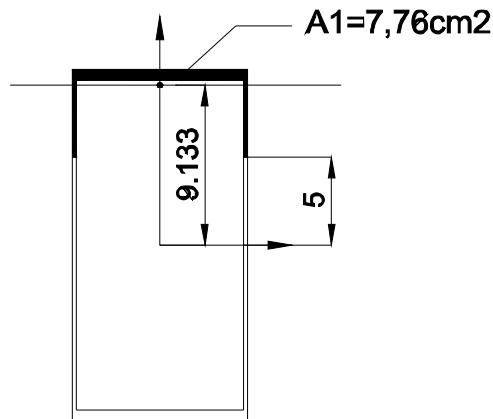


**b) Tensões normal e tangencial.**

$$\sigma = \frac{2,1}{19,52} + \frac{1800 \times 5}{1350,9} = 0,11 + 6,66 = 6,77 \frac{kN}{cm^2}$$

$$\tau = \frac{-10,6 \times 70,9}{1350,9 \times 2 \times 0,2} = -1,39 \frac{kN}{cm^2}$$

Figura auxiliar para cálculo do momento estático:

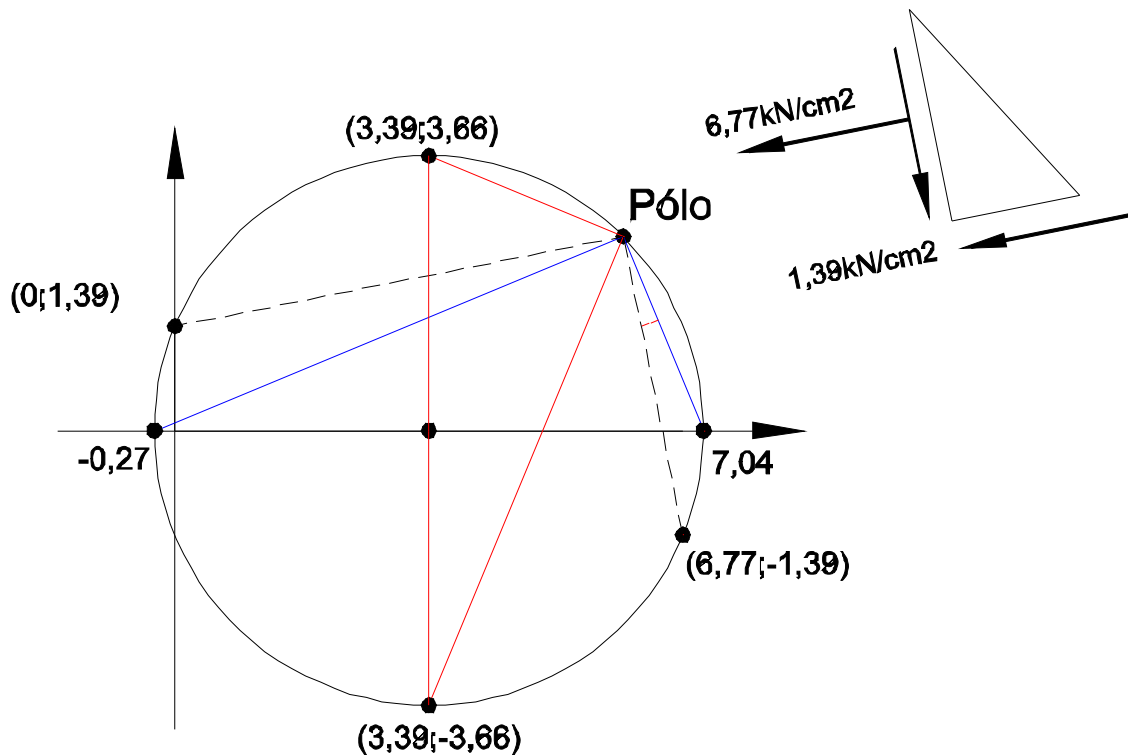


$$S = 2 \times 0,2 \times 5 \times 7,5 + 9,6 \times 0,6 \times 9,7 = 70,9 cm^3$$

ou

$$S = 7,76 \times 9,133 = 70,9 cm^3$$

**c) Círculo de Mohr.**



**d) Tensões extremas.**

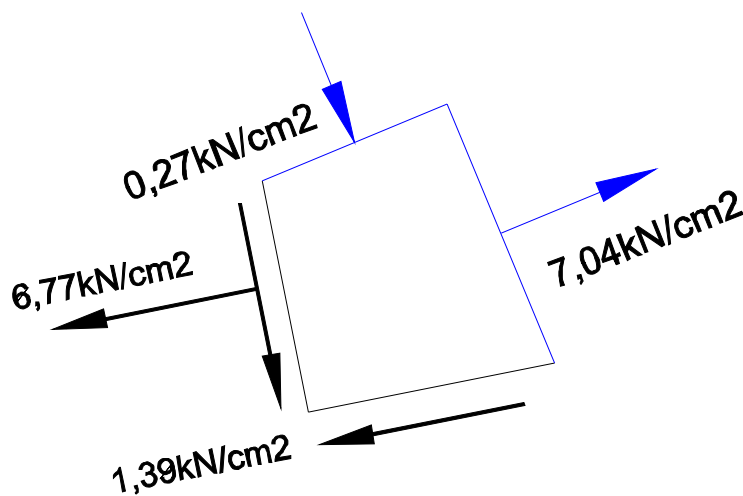
Tensões principais.

$$\sigma_1 = \frac{6,77}{2} + \sqrt{\left(\frac{6,77}{2}\right)^2 + (-1,39)^2} = 7,04 \frac{kN}{cm^2}$$

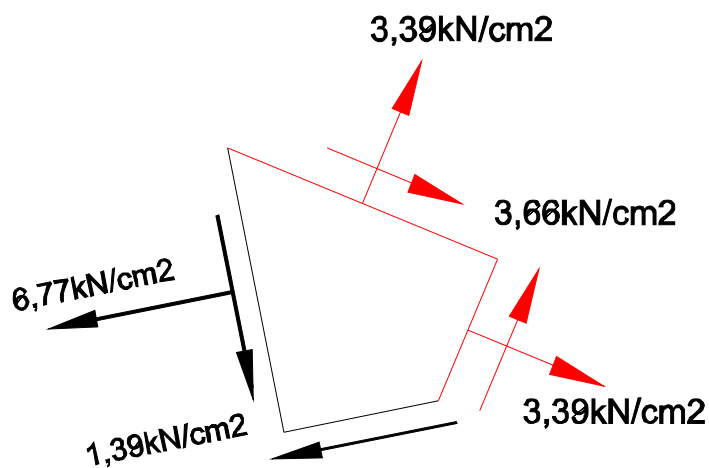
$$\sigma_2 = \frac{6,77}{2} - \sqrt{\left(\frac{6,77}{2}\right)^2 + (-1,39)^2} = -0,27 \frac{kN}{cm^2}$$

$$\tan(\alpha) = \frac{7,04 - 6,77}{-1,39}$$

$$\alpha = -11^\circ$$



Tensões tangenciais máxima e mínima.



$$\tau_{\max} = -\tau_{\min} = \frac{\sigma_1 - \sigma_2}{2} = 3,66 \frac{kN}{cm^2}$$