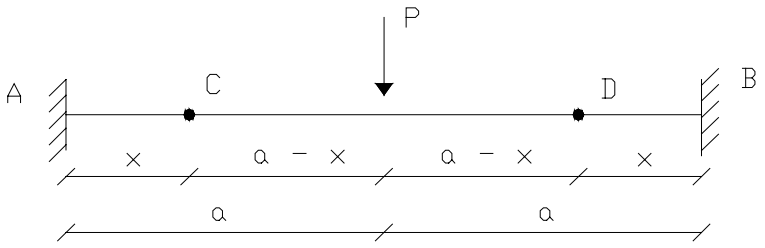
PEF-2201 Resistência dos Materiais e Estática das Construções – 2ª Prova – 22.02.2002

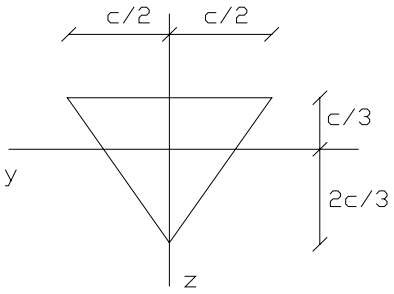
Nº USP:_____Nome:_____

2ª Questão (3,5)

Dada a estrutura da figura, articulada nos pontos C e D, determinar:

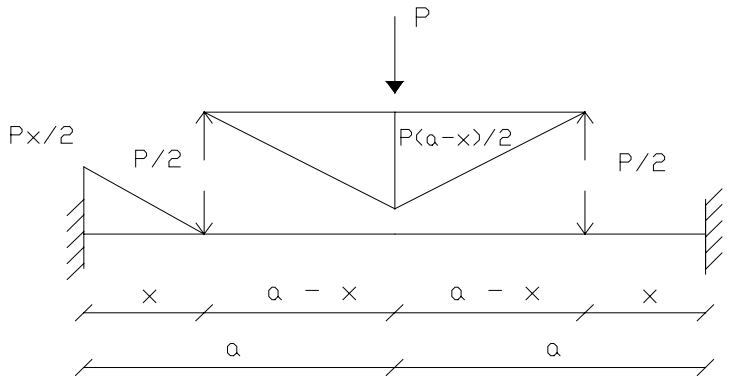
a) considerando $a/3 \le x \le 2a/3$, a máxima tensão de tração e a máxima tensão de compressão, em função de *P, a, c* e *x;*
b) considerando, em seguida, $\overline{\sigma}_T = \overline{\sigma}$ *e* $\overline{\sigma}_C = 2\overline{\sigma}/3$, a dimensão de *x* correspondente xxx dimensão *c* mais econômica.





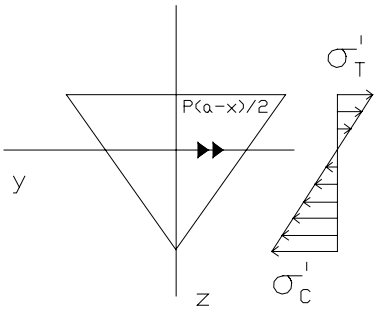
Solução :

Diagrama de momento fletor:



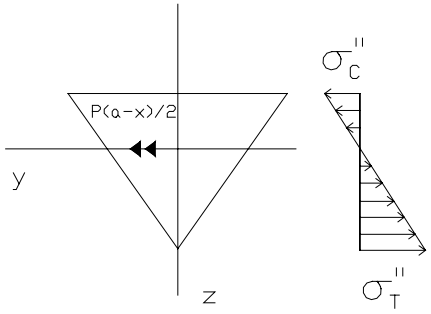
No engastamento:

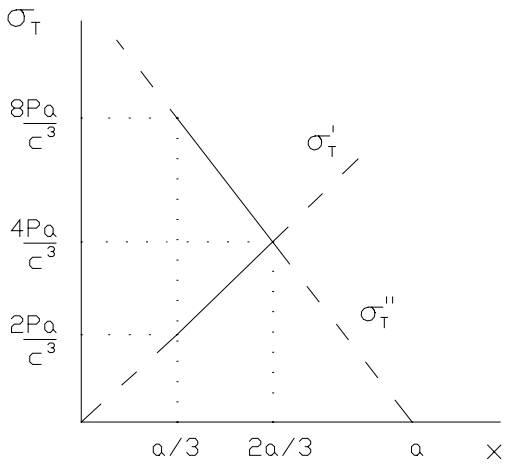
$$\sigma'_T = \frac{1}{2} Px \cdot \frac{36}{c^4} \cdot \frac{c}{3} = \frac{6Px}{c^3} \qquad \sigma'_C = \frac{1}{2} Px \cdot \frac{36}{c^4} \cdot \frac{2c}{3} = \frac{12\,Px}{c^3}$$

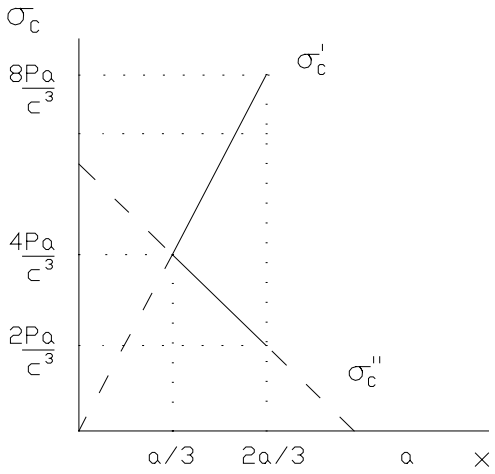


No meio do vão:

$$\sigma''_T = \frac{1}{2} P(a-x) \cdot \frac{36}{c^4} \cdot \frac{2c}{3} = \frac{12P(a-x)}{c^3} \qquad \sigma''_C = \frac{1}{2} P(a-x) \cdot \frac{36}{c^4} \cdot \frac{c}{3} = \frac{6P(a-x)}{c^3}$$







$$\frac{1}{3}a \le x \le \frac{2}{3}a \quad \Rightarrow \quad \sigma_{T\max} = \sigma''_T = \frac{12P(a-x)}{c^3} \le \bar{\sigma} \quad \Rightarrow \quad c^3 \ge \frac{12P(a-x)}{\bar{\sigma}}$$

$$\sigma_{C\max} = \sigma'_C = \frac{12Px}{c^3} \le \frac{2}{3}\bar{\sigma} \quad \Rightarrow \quad c^3 \ge \frac{18Px}{\bar{\sigma}}$$