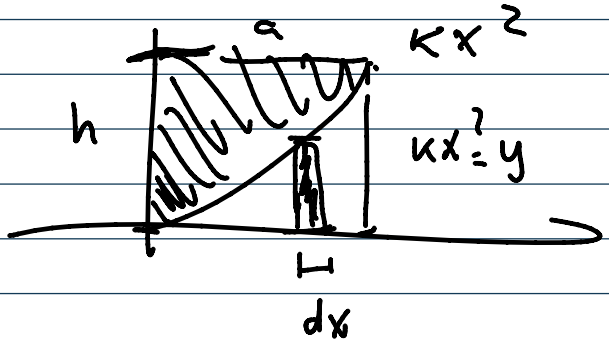
Lista 5

quarta-feira, 2 de dezembro de 2020 20:09

Lucas Lima

9.4)



$dA = kx^2 \cdot dx$

(1) $I_y = \int x^2 \, dA$

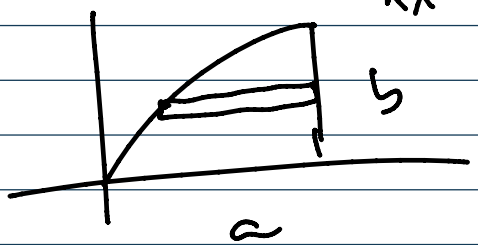
$I_y = \int_0^a x^2 \cdot kx^2 \, dx$

$I_y = k \left. \frac{x^5}{5} \right|_0^a = \frac{ka^5}{5}$

(2) $I_y = \frac{a^3 h}{3}$

$\therefore R = \frac{a^3 h}{3} - \frac{ka^5}{5}$

9.6)



$dy = ka^{\frac{1}{3}}$

$I_x = \int y^2 \, dA$

$dA = ka^{\frac{1}{3}} \cdot dy$

$I_x = \int y^2 \cdot k \cdot a^{\frac{1}{3}} \cdot dy$

$k \cdot a^{\frac{1}{3}} \int_0^b y^2 \, dy = ka^{\frac{1}{3}} \cdot \left. \frac{y^3}{3} \right|_0^b = \frac{kb \cdot a^{\frac{1}{3}}}{3}$

9.10) $b = ka^{5/2} \Rightarrow k = \frac{b}{a^{5/2}} \quad \therefore \quad y = \frac{b}{a^{5/2}} \cdot x^{5/2}$

$dI_x = \frac{y^3}{3} dx \Rightarrow I_x = \int_0^a \frac{b^3 x^{15/2}}{3a^{15/2}} dy =$

$$\frac{2b^3}{51} \cdot \frac{x^{\frac{17}{2}}}{a^{15/2}} \Big|_0^a = \boxed{\frac{2ab^3}{51}}$$

$K_x = \sqrt{\frac{I_x}{A}} \qquad A = \int_0^a \frac{b}{a^{5/2}} \cdot x^{5/2} dx = \frac{2b}{7a^{5/2}} \cdot x^{\frac{7}{2}} \Big|_0^a =$

$\frac{2ab}{7} \Rightarrow K_x = \sqrt{\frac{2a^2b^2 \cdot 7}{51 \cdot 7 \cdot a^2 b}} =$

$$K_x = b\sqrt{\frac{7}{51}}$$

9.16) $I_O = I_x + I_y$ LUCAS LIMA

$$I_O = a^4\left(\frac{-37}{144} + \frac{13}{12}\right) = \frac{119\,a^4}{114}\ u.i$$

$I_x = [\bar{I}_{x_0} + A d_y^2] - 2[\bar{I}_{x_2} + A d_x^2]$

$I_x = [a^4/6 + 2a^2 \cdot 0) - 2(a(r_2)^3/36 + (a^2/4)(a - \frac{a}{6})^2)$

$I_x = a^4/6 - \frac{a^4}{144} - \frac{a^4}{2} + \frac{a^4}{6} - \frac{a^4}{12} = -\frac{37a^4}{144}\ u.i$

$$I_y = (\bar{I}_{y0} + A d x^2) - 2(I_{xA} + A dx^2)$$

$$I_y = (2a^4/3 + a^4/2) - 2(a^4/12 + (a^2/4)(a^2/4))$$

$$I_y = 2a^4/3 + a^2/2 - a^4/36 - a^4/12 = \frac{13a^4}{12} \text{ u.i.}$$

$$r_0 = \sqrt{I_0/A} \rightarrow k_0 = \sqrt{I_0/2a^2 - 2a^2/4}$$

$$r_0 = \frac{\sqrt{119a^2}}{17} \cong 0{,}83a \text{ u.c}$$

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9.22) $A = 2(120^2) + 60 \cdot 300 = 46800 \text{ mm}$

(I) $I_y = \bar{I}_y + A d^2$

$$I_y = \frac{120^3 \cdot 120}{12} + 120^2 \cdot 90^2$$

$$I_y = 113{,}92 \cdot 10^6 \text{ mm}^4$$

(II) $I_y = \bar{I}_y = \frac{300^3 \cdot 60}{12} = 135 \cdot 10^6 \text{ mm}^4$

(III) $I_y = I_{yI} = 113{,}92 \cdot 10^6 \text{ mm}^4$

$I_{y\ TOTAL} = 362,84 \cdot 10^6\ mm^4$

$K_y = \sqrt{\frac{362,84 \cdot 10^6}{46800}} \Rightarrow K_y = 88,05\ mm$

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9.26)

$I = \left(4a \cdot \frac{(4a)^3}{12} + [4a]^3 4a/12\right) - 2\left(\left(\frac{\pi a^4}{8} + \frac{\pi a^4}{8}\right) + \right.$

$\left. \pi a^2\left(0 + \left(2a - \frac{4a}{3\pi}\right)^2\right)/2\right) - 2\left(\left(\frac{\pi a^4}{8} + \frac{\pi a^4}{8}\right) + \pi a^4 (L\right.$

$\left. 2a^4 - 4a/3\pi)^2 + 0)/2\right) \qquad a = 0,02m$

$I = (-3,11 \cdot 10^{-4} + 3,12 \cdot 10^{-4})\ m^4$