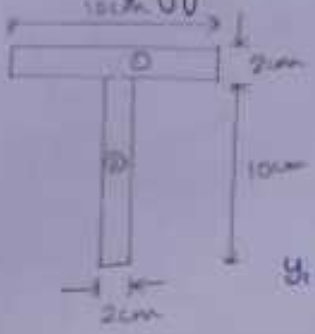
Determine moments of inertia of the T-section shown in figure about centroidal axes. Also, find the radii of gyration about the same axes.



$A_1 = l \times b = 10 \times 2 = 20 cm^2$

$A_2 = l \times b = 10 \times 2 = 20 cm^2$

Since it is symmetrical about yaxis

$\bar{x} = \frac{10}{2} = 5cm$

$y_1 = 10 + \left(\frac{2}{2}\right) = 11 cm ; \quad y_2 = \frac{10}{2_1} = 5cm$

$\bar{y} = \frac{a_1 y_1 + a_2 y_2}{a_1 + a_2} = \frac{320}{40} = 8cm$ $\boxed{\bar{y} = 8cm}$

Moment of inertia,

$I_{xx} = I_1 + I_2$

$h_1 = (y_1 - \bar{y}) = 3cm$

$h_2 = (y_2 - \bar{y}) = 3cm$

$I_1 = I_{g_1} + A_1 h_1^2$

$= \frac{bd^2}{12} + [20 \times 3^2]$

$= \frac{10 \times 2^3}{12} + [20 \times 3^2]$

$I_1 = 186.66 cm^4$

$I_2 = I_{g_2} + A_2 h_2^2$

$= \frac{bd^3}{12} + [20 \times 3^2]$

$= \frac{2 \times 10^3}{12} + [20 \times 3^2]$

$= 346.66 cm^4$

$I_{xx} = I_1 + I_2$

$\boxed{I_{xx} = 533.32\ cm^4}$

Similarly,

$I_{yy} = I_1 + I_2$

$x - \bar{x} = 0$

$I_1 = I_{g_1} + A_1 h_1^2$

$A_1 h_1^2$ is negligible

$= \frac{db^3}{12} \Rightarrow \frac{2 \times 10^3}{12}$

$= 166.66\ cm^4$

$I_2 = I_{g_2} + A_2 h_2^2$

$= \frac{db^3}{12} + 0$

$= \frac{10 \times 2^3}{12}$

$= 6.66\ cm^4$

$I_{yy} = I_1 + I_2$

$I_{yy} = 173.32\ cm^4$

$K_{xx} = \sqrt{I_{xx}/A} = \sqrt{13.33} = 3.65\ cm$

$K_{yy} = \sqrt{I_{yy}/A} = \sqrt{4.33} = 2.08\ cm$