

Course Code: ESC106A

Course Title: Construction Materials and Engineering Mechanics

Lecture No. 44:

Problems on Centre of gravity and Moment of Inertia

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Lecture Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Calculate the co-ordinates of the centroid of the composite area after converting the composite section into simple regular areas.
- Solve for the Moment of Inertia of sections with respect to the considered axis.



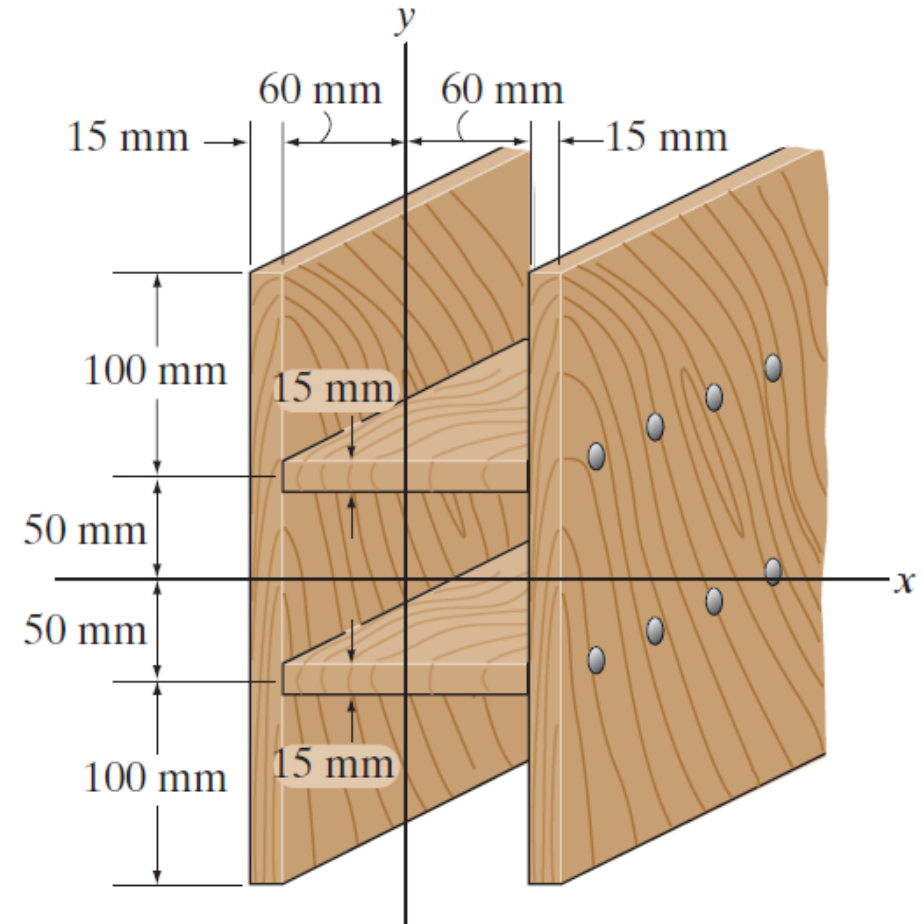
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Problems on Center of Gravity and Moment of Inertia



Problems on CG and MI

1. Determine the moment of inertia of the beam's cross-sectional area about the y axis



$$I_{YY} = 43,335,000 \text{ cm}^4$$

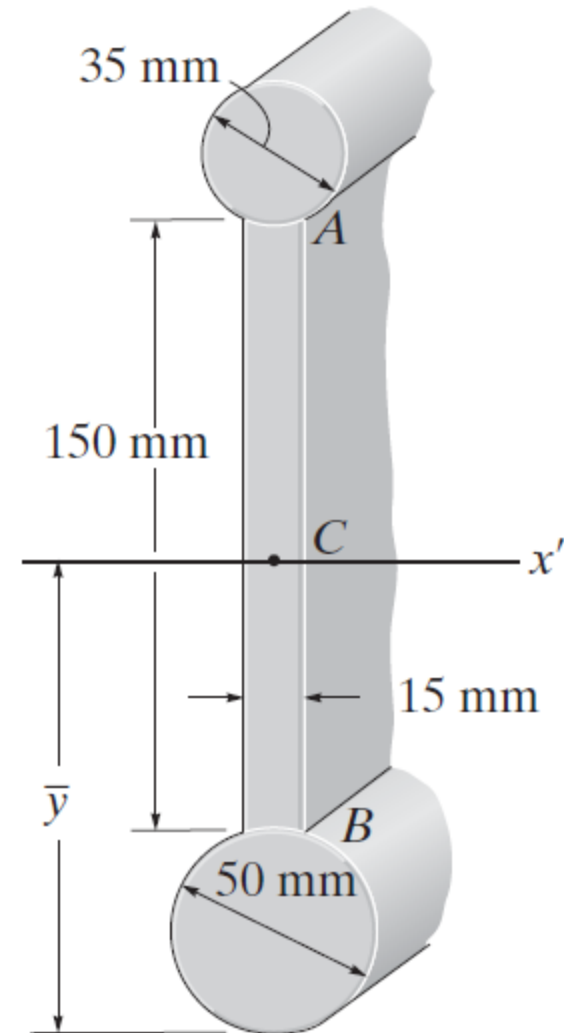
Problems on CG and MI

2. Determine the moment of inertia of the beam's cross-sectional area with respect to the x' axis passing through the centroid C of the cross section.

Ans :

$$\bar{y} = 104.3 \text{ mm}$$

$$I_{YY} = 30,239,475 \text{ mm}^4$$



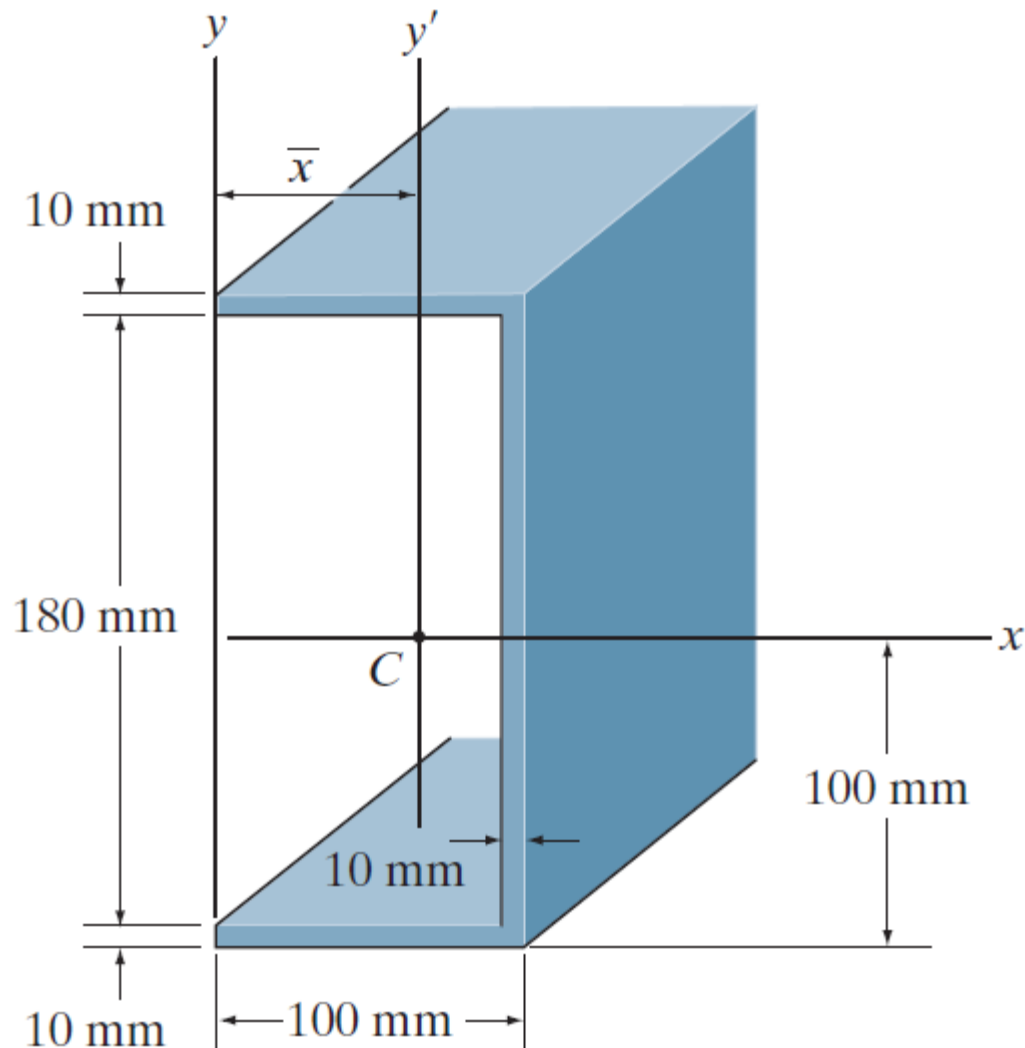
Problems on CG and MI

3. Locate the centroid \bar{x} of the beam's cross-sectional area, and then determine the moment of inertia of the area about the centroidal \bar{y} axis.

Ans :

$$\bar{x} = 71.32mm$$

$$I_{yy} = 3,600,088 mm^4$$



Summary

- The composite areas are divided into simple areas and the coordinates of the centre of gravity can be determined
- Moment of inertia with respect to centroidal axis is calculated on the basis of parallel axis theorem and perpendicular axis theorem

