

**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.



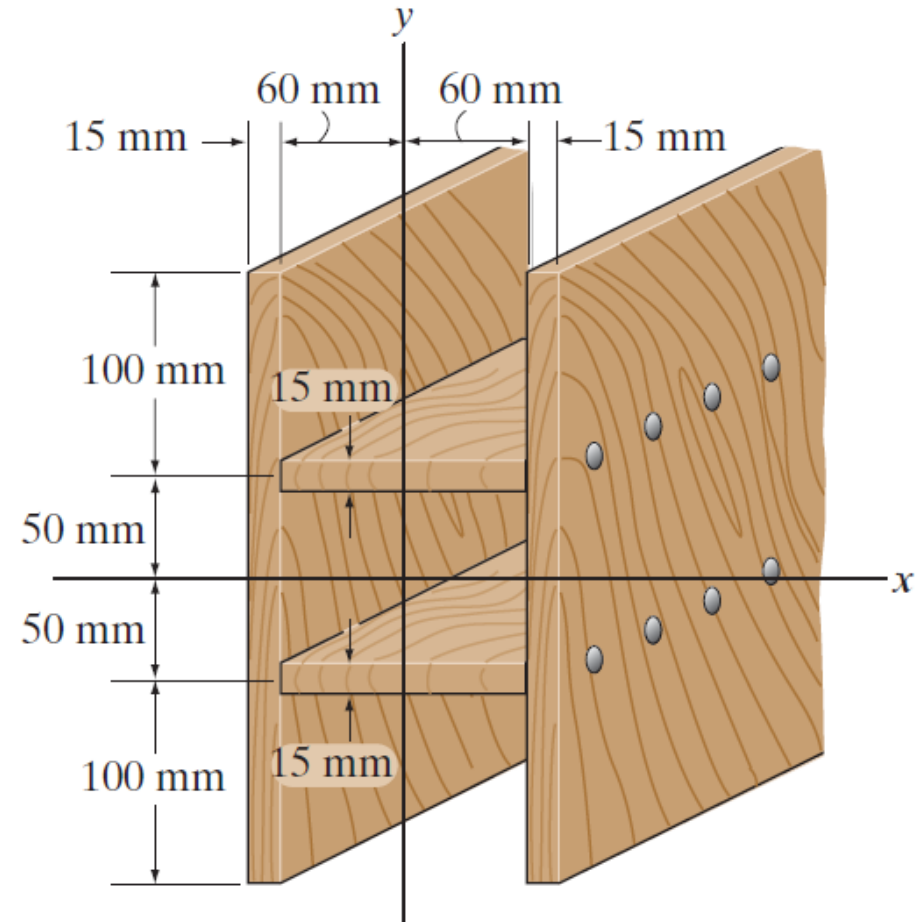
# Contents

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



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



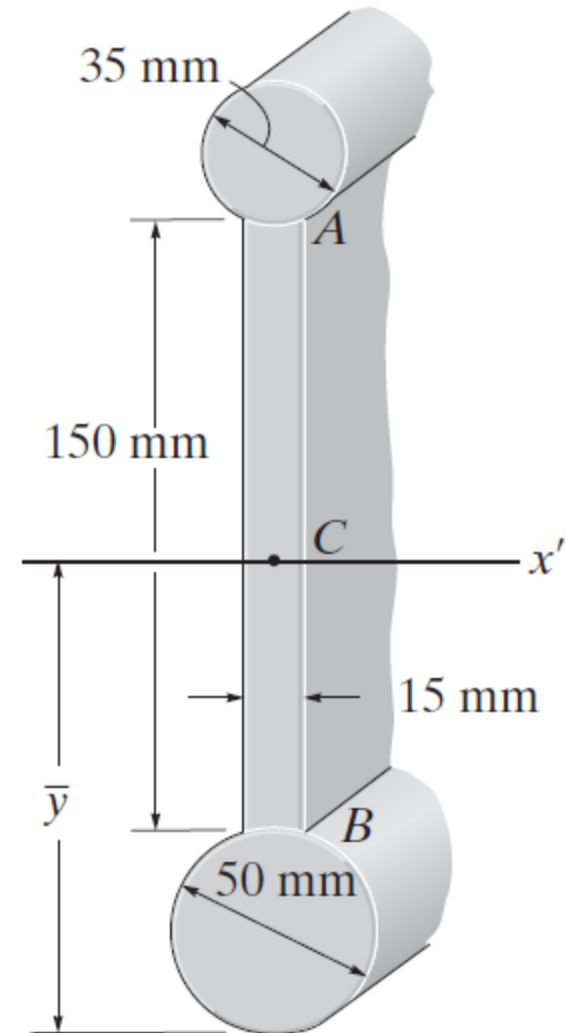
# Problems on CG and MI

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 :*

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

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



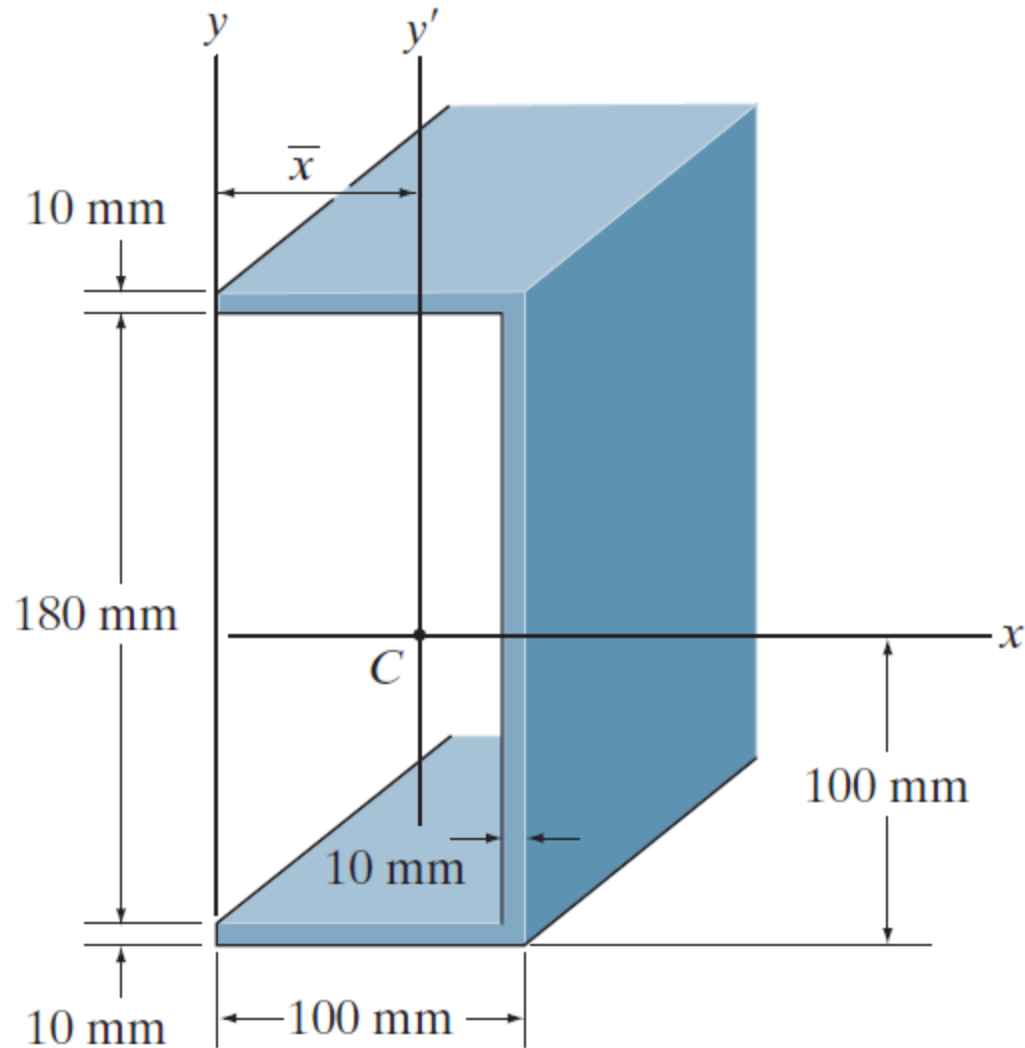
# Problems on CG and MI

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 :*

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

$$I_{YY} = 3,600,088 \text{ mm}^4$$



# 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

