

Practical No. 15: Verify centroid of plane figure of given dimensions by making simple paper model

I. Practical Significance

We use various types of shapes, lamina, and composite bars/wires in the constructions, in machines and mechanisms for different purposes. Specific shape is chosen for cross section of a beam, column and other structural member. One of the most important geometric property of the shapes is center of gravity or centroid. The plane figure like circle triangle square has only area, but no mass. The centre of area of plane figure is known as centroid.

II. Industry/Employer Expected Outcomes

Apply the principles of engineering mechanics to find out centroid of different structural cross-section such as Beam, Column, Dam and Retaining wall etc.

III. Course Level Learning Outcome(s)

CO5- Determine the centroid/centre of gravity of the structural elements of having specific shape and size.

IV. Laboratory Learning Outcome(s)

Apply the concept of centroid for given objects.

V. Relevant Affective Domain related Outcome(s)

- Follow safety practices and precautions.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment.

VI. Relevant Theoretical Background

Centre of gravity: The centre of gravity of a body is that point through which the resultant of the system of parallel forces formed by the weights of all the particles of the body passes. for all positions of the body.

Centre of Mass: The point at which the whole mass of a body is supposed to be concentrated is known as centre of mass.

Centroid: Is is the point at which whole area of the body is supposed to be concentrated.

VII. Actual diagram used in laboratory with equipment specifications.

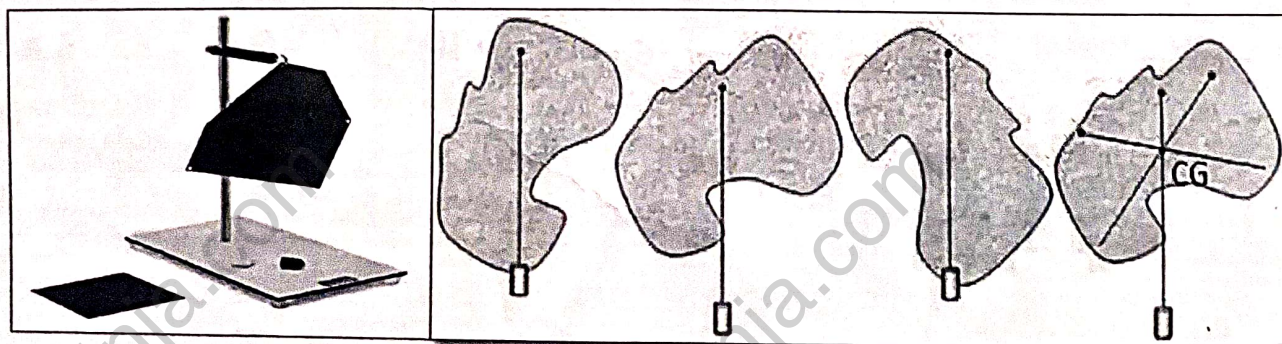


Fig.15.1 Step wise location of centroid with the help of centre of mass

VIII. Requires Recourses/Apparatus/Equipment with Specifications

Sr. No.	Particulars	Specification	Quantity	Remark
1	Sheet of paper / Hardboard		01 for each shape	
2	Scissor/cutter		01 for batch of 3 to 4 students	
3	Plumb bob with string		01 for batch of 3 to 4 students	
4	Marker pen		01 for batch of 3 to 4 students	

IX. Precautions to be followed

1. Line should be connected to each other accurately.
2. Drawing errors should be reduced to minimum so as to get correct results

X. Procedure

1. Draw any shape on sheet of hard board. And mark holes on a Shape.
2. Hang that shape on a peg through the desire hole.
3. Hang a plumb bob and mark plumb line with marker.
4. Repeat same procedure for other holes.
5. Mark the point of intersection of these lines this point gives the centroid of that lamina by experimentally.
6. Also calculate the center of gravity of that plane lamina by analytically.

XI. Observations Table

Sr. No.	Shape	Dimensions (mm)			X-Coordinate(mm)	Y-Coordinate(mm)
		L	b	H		
1	Square	198	198	198	99	99
2	Rectangle	225	123	160	62.5	61.5
3	Triangle		60	190	20	63.33
4	Circle	$r = 75$			75	75
5	Semicircle	$r = 75$			31.83	75
6	Trapezium					

XII. Results

1. Centroid of Square =
2. Centroid of Rectangle =

3. Centroid of Triangle =
4. Centroid of Circle =
5. Centroid of Semicircle =
6. Centroid of Trapezium =

XIII. Interpretation of results

Centroids of plane figures calculated by using formula are nearly equal to measured value of centroid with plumb line.

We have complete this practical
Sucesfully.

XIV. Conclusions and Recommendations

XV. Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO. Write answers of minimum three questions.

1. Define Centroid and Centre of gravity.
2. Find the position of centroid of a quarter circle having 100cm as diameter.
3. Find centre of gravity of solid cylinder diameter 100mm and height 150mm.
4. Show the C.G of cone with diagram.
5. Locate the centroid of T section 100mm×100mm×10mm having total depth of 100mm

Space for answers

Q.17 → ?

Ans:- Centroid :- it is the point of which
whole area of the body is supposed
to be concentrated.

Centre of gravity :- It is point at which
whole mass of the body is supposed
to be concentrated.

Q.47 → ?

Ans:- The centre of gravity of solid h
emisphere lies on the central gravity
at a distance of from the plane base.

③ $\longrightarrow$?

Ans:-

Explanation:- Centre of gravity of right circular cone lies at a distance of $h/4$ from the base and at a distance of $3h/4$ from the apex.

