Department of Civil Engineering
Katihar Engineering College, Katihar

Subject : Introduction to Solid Mechanics
Topic : Shear Centre
Lecture : 04
Course Instructor : Prof. Rashid Mustafa

⇒ SHEAR CENTRE :

Introduction

(i) The theory of simple bending is valid if the section is symmetric about the plane of loading.

(ii) Therefore, the plane of loading contains a principal axis of the beam x-section and loads are perpendicular to one of the symmetrical transverse axis of the beam x-section.

(iii) In such cases the bending takes place without twisting.

(iv) In general cases, when the beam have no axis of symmetry then the loads may induced torsion.

Shear Centre: Shear centre is that point through which if concentrated load passes then there will be no twisting of the x-section & only bending will occur.

→ It is that point through which resultant shear passes, it is also called Centre of flexure

Note: The exact location of the shear centre for an unsymmetrical x-section is very complicated & can be located by inspection only in few cases.

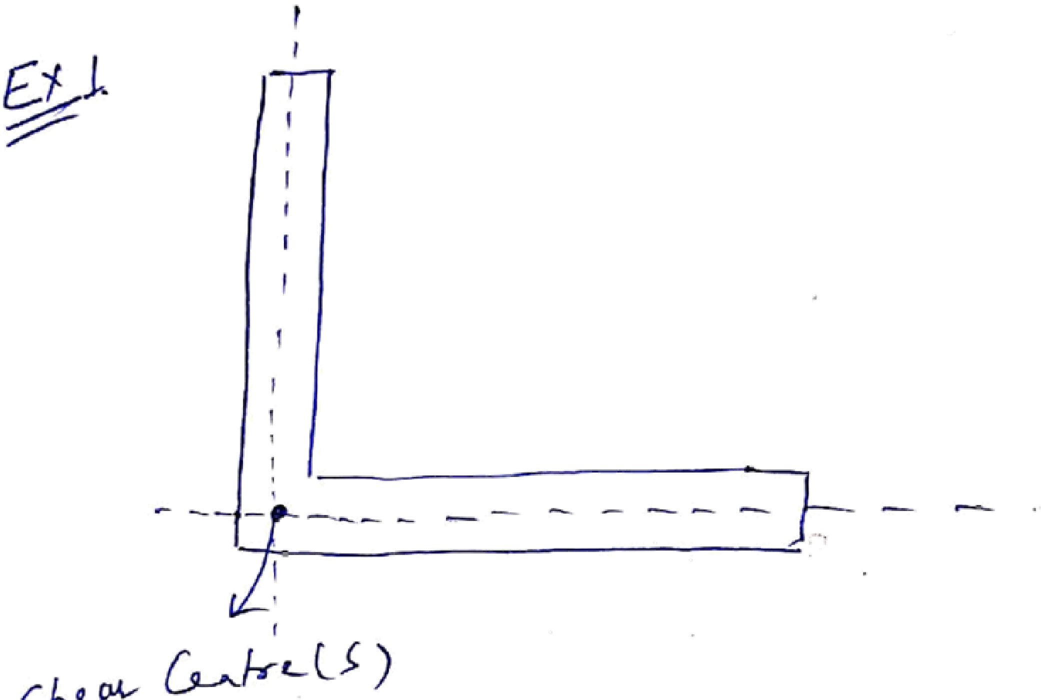
⇒ Thumb Rule to locate Shear Centre:

1. Shear centre always lies on the axis of symmetry (If existing)

(ii) If there are more than one axis of symmetry then shear centre will lies on the intersection of symmetrical axis, it means for such x-section, shear centre will coincide with the centroid of the x-section.

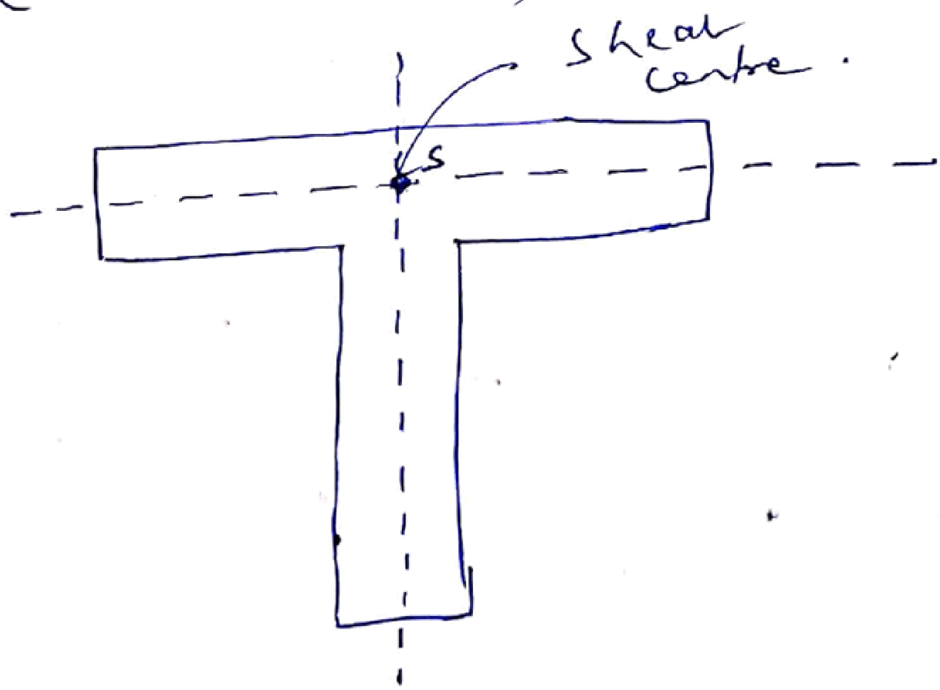
(iii) If a section is madeup of two narrow rectangles then shear centre will be located on the intersection of axis of symmetry (along greater length) of both the rectangle.

Ex 1.



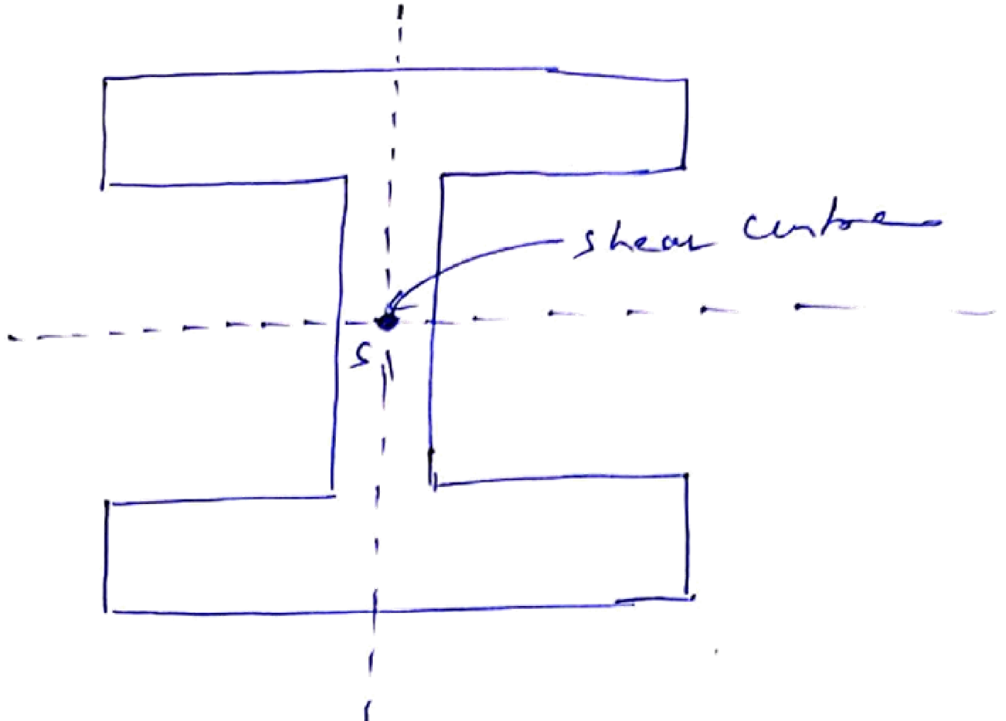
(3rd thumb rule)

Ex-2



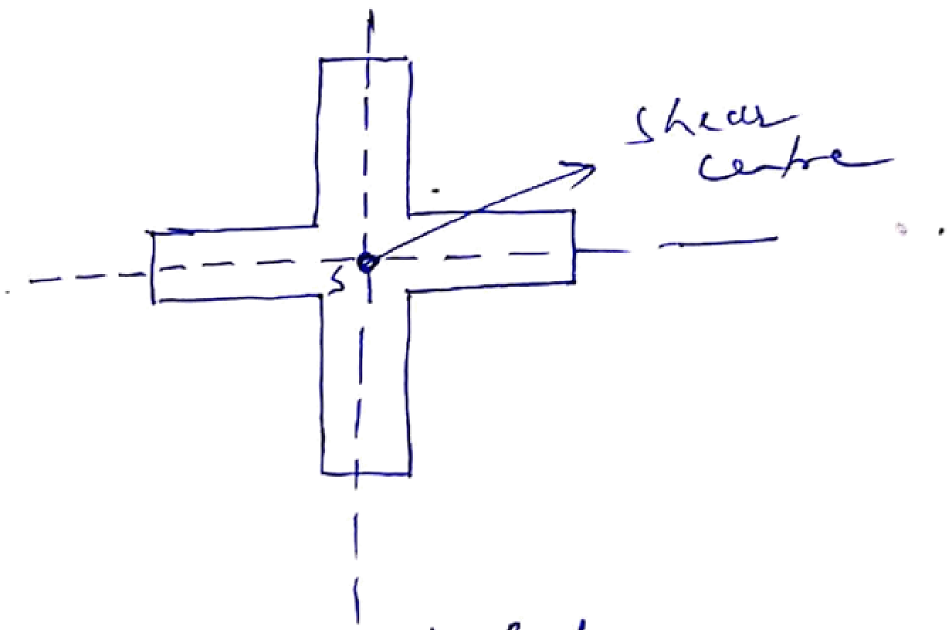
(3rd thumb rule)

Ex-3



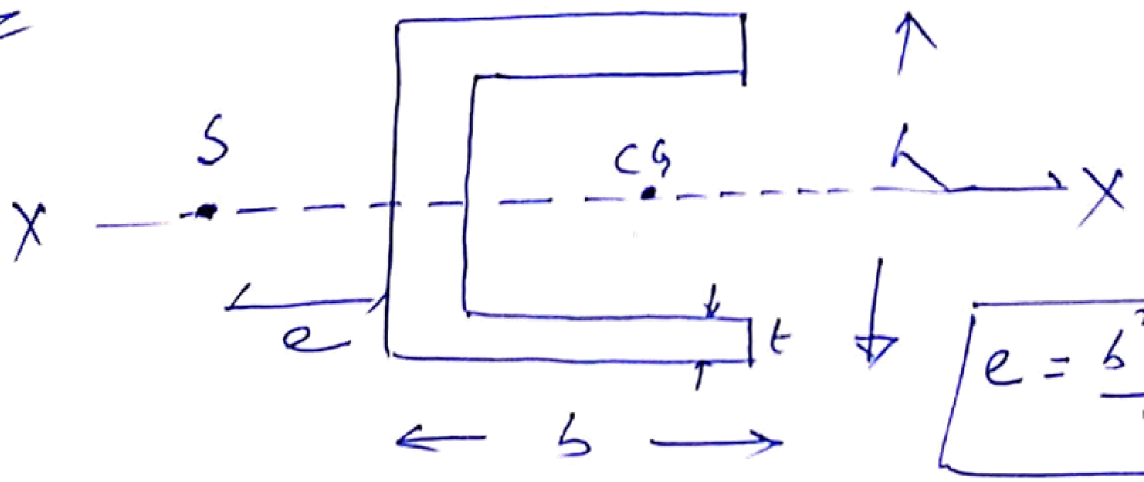
(2nd Rule)

Ex-4



(2nd Rule)

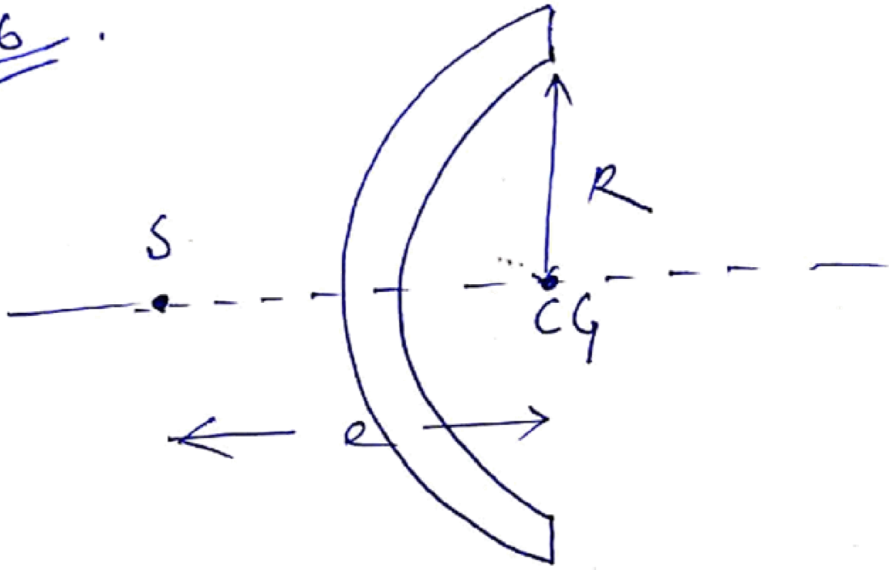
Ex-5



$$e = \frac{b^2 h^2 t}{4 I_{xx}}$$

XX → Axis of symmetry.

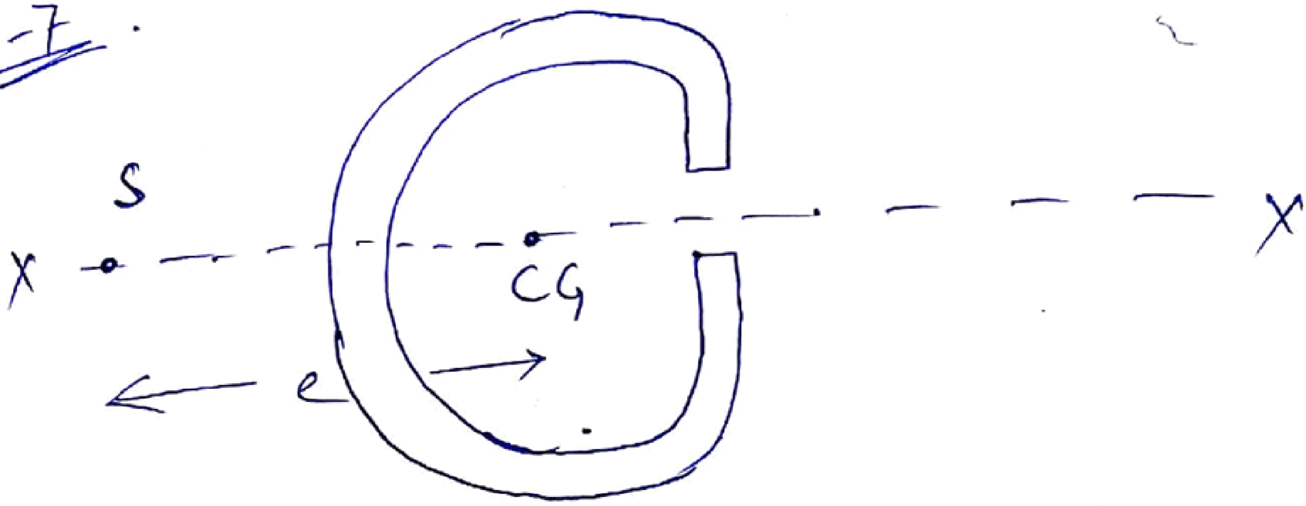
Ex-6.



Semi Circular section

$$e = \frac{4R}{\pi} \simeq 1.27R$$

Ex-7.



(open-slit c/s)

$(e = 2R)$

Shear flow (q) : It is defined as shear force per unit length of beam is called shear flow.

→ It is denoted by q.

$$\text{Shear flow } (q) = \frac{F}{\Delta x} = \frac{V \cdot A\bar{y}}{I}$$

$$q = \frac{V \cdot A \cdot \bar{y}}{I}$$

HAPPY LEARNING