



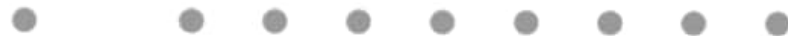
## **Experiment Number: 03**

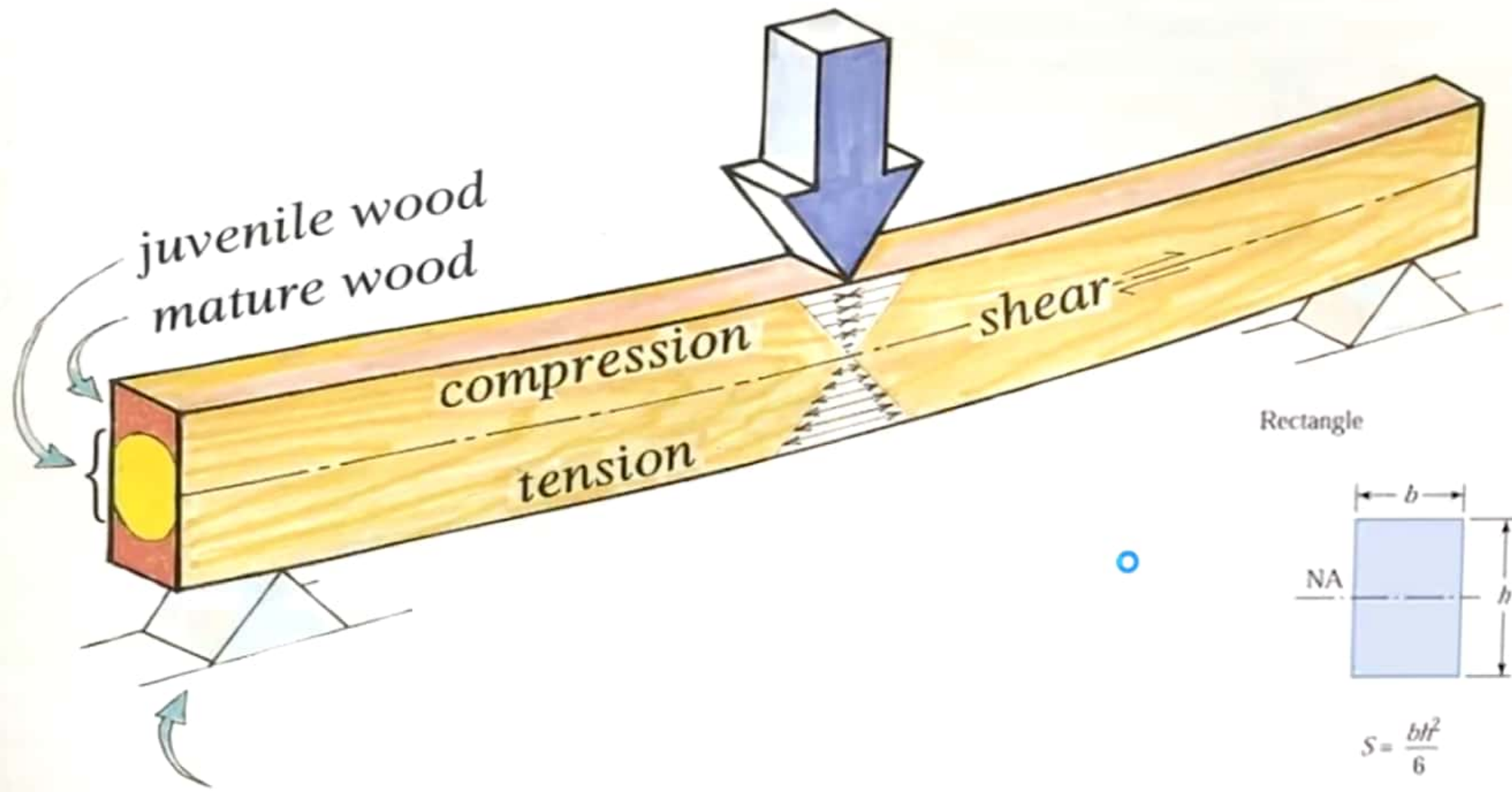
**Experiment Name:** Determination of static bending test of wooden beam



# Introduction:

- **Deflection:**
- **Modulus of Elasticity:**
- **Bending Moment:**
- **Shearing Stress**
- **Flexural stress**





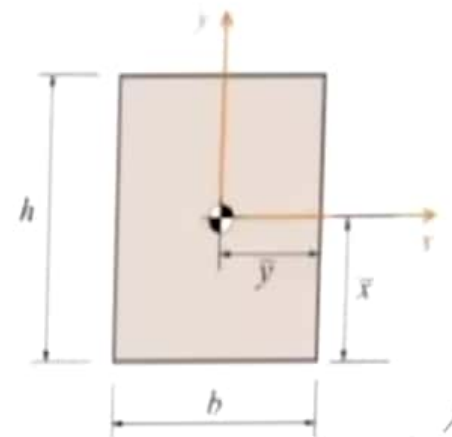
(3) Determine bending stress

For symmetric sections:

$$\sigma_{\max}^+ = \sigma_{\max}^- = \frac{Mc}{I}$$

**M:** Internal moment in the beam.

**c:** Distance of the farthest point of section from the horizontal axis



# Objectives:

- (i) To determine the maximum deflection.
- (ii) To determine the maximum bending moment.
- (iii) To determine the maximum bending stress.
- (iv) To determine the maximum shearing stress.
- (v) To determine the modulus of elasticity.
- (vi) To determine the modulus of elasticity from graph paper.

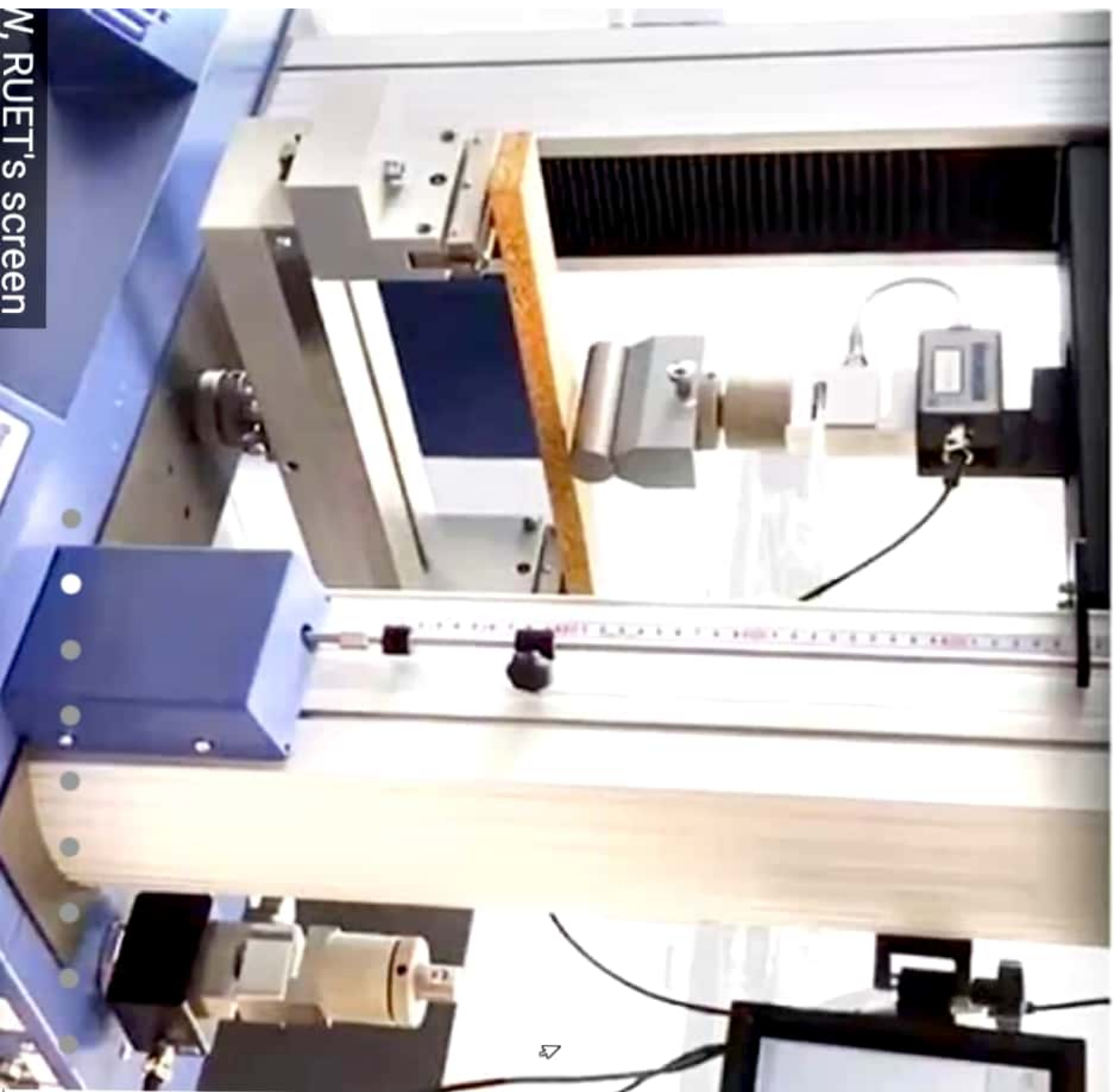


# Apparatus:

- Slide Calipers
- Universal Testing Machine (**UTM**)
- Dial gauge
- Steel scale
- Sample of wooden beam
- Arrangement of simple support



# Procedure:



M, RUET's screen



**Beam tested  
under UTM  
machine**

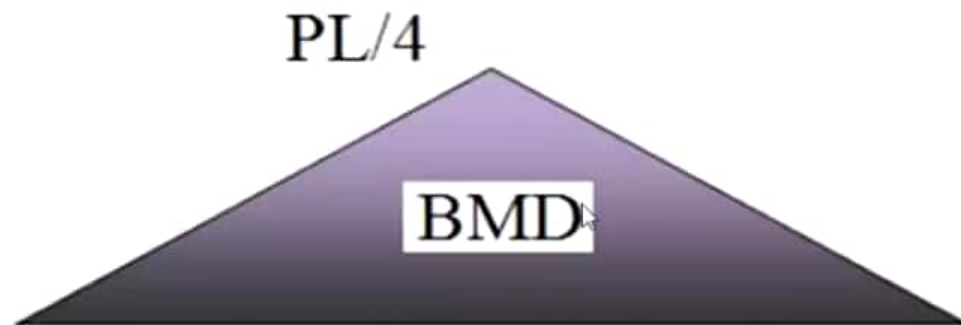
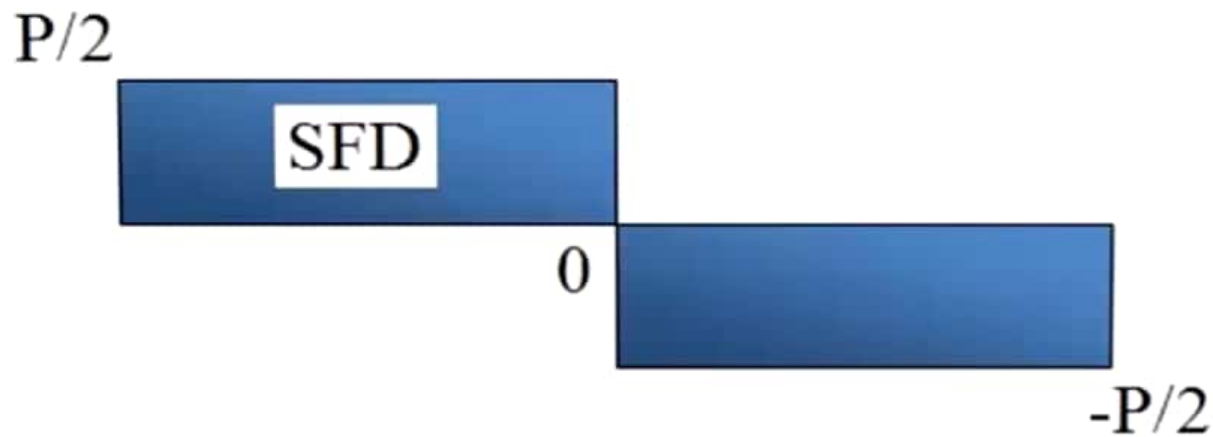
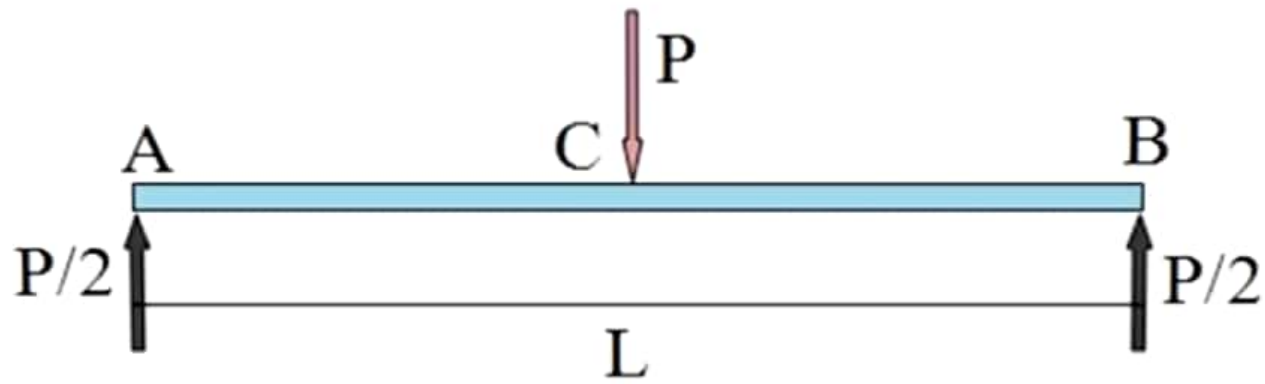
# Data Table:

Constant = 0.001

Load (kN)	Load (lb)	Gauge reading in deflection	Deflection in inch
2.5		15	0.015
5.0		25	0.025
7.5		36	0.036
10.0		52	0.052
12.5		73	0.073
15.0		98	0.098



# Calculation:



Shear force and bending moment diagram

# Calculation:

The Flexure Formula:

$$\sigma_{\max} = \frac{Mc}{I}$$

Annotations for the Flexure Formula:

- $\sigma_{\max}$ : Max bending stress, psi
- $M$ : Internal bending moment, lb-in
- $c$ : Distance from NA to outer fiber, in
- $I$ : Moment of inertia, in<sup>4</sup>

$b = 2.25$  inch

$h = 3$  inch

$$\sigma = \frac{My}{I}$$

Or in general:

$$\sigma = E\varepsilon$$

$$\frac{P}{A} = E \frac{\delta}{L} \rightarrow \delta = \frac{PL}{EA}$$

## Shearing Stress

$$\tau = \frac{VQ}{Ib}$$

$\tau$  = Shear Stress

$V$  = Shear Force at the specified section

$I$  = Moment of Inertia about the neutral axis

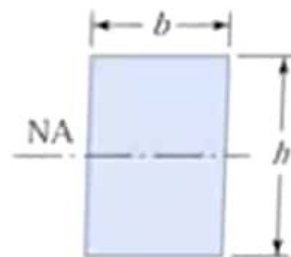
$b$  = Width of section at the point of shear stress

$$Q = A \bar{y}$$

$A$  = Area of the section above the point of shear stress

$\bar{y}$  = distance of centroid of area from neutral axis

Rectangle

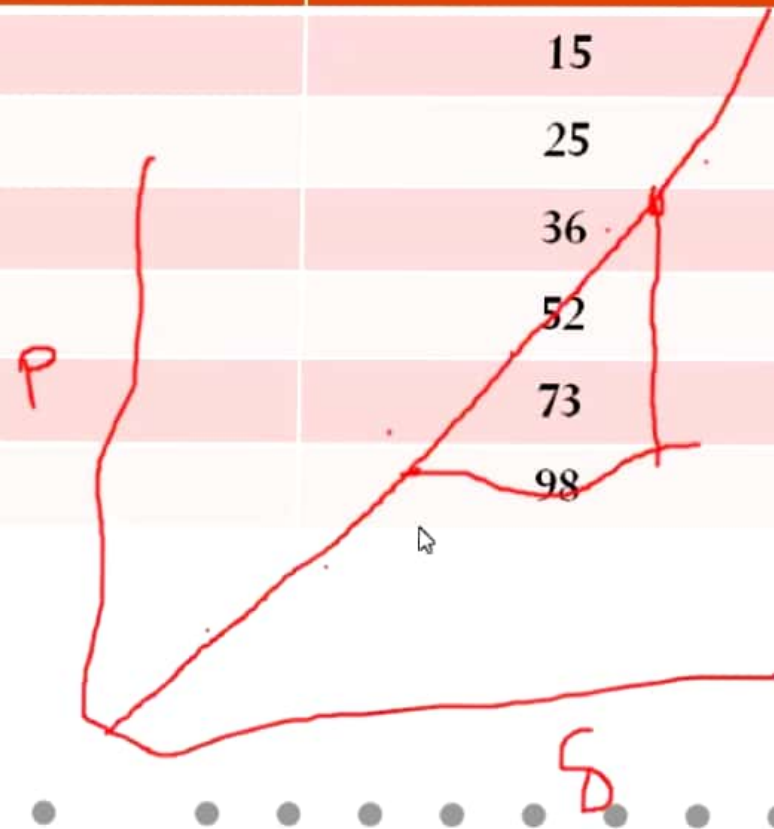


$$S = \frac{bh^2}{6}$$

# Data Table:

Constant = 0.001

Load (kN)	Load (lb)	Gauge reading in deflection	Deflection in inch
2.5		15	0.015
5.0		25	0.025
7.5		36	0.036
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**Results:**

**Discussions:**

