1 INTRODUCTION TO STRUCTURE

1.1. Structure

An elastic body is termed as structure when it provides resistance against deformation due to the load acting over it.

1.1.1. Mechanism

In a mechanism no resistance is setup against deformation.

Assumption

- Elastic body
- Homogenous
- Isotropic
- Continuous Solid Structure
- Principal of Super position is valid.

Validity of Super position Principle

- Displacement is small.
- Elastic material and linear structural response. Load vs deformation is a straight line.
- Suppose are unyielding.
- Not valid for sender columns.

1.1.2. Classification of Structures

- Skeletal — e.g., Roof truss, building frames.
- Surface — e.g., Slabs and shells
- Solid — e.g., massive foundation

Skeletal Structure

- **Pin Jointed :** develop axial forces, external load @ joint, members are straight.
- **Rigid Jointed:** Angle between the member meeting @ joint remain unchanged, Resist external forces by developing bending moment, shear force, axial force, twisting moments.

Plane Frame	Space Frame
All member and forces are in one plane.	All members don't lie on one plane.
Axial	Axial
Shear	Biaxial Shear
Bending Moment	Biaxial Moment
	Twisting Moment

1.1.3. Poissons Ratio (μ)

Defined as the ratio of lateral strain to linear strain.

Concrete = 0.15
Steel = 0.33
Cork = 0
Isotropic material = 0.25

μ_{max} = 0.5 Ideal Elastic incompressible meter.

Bernoulli's Assumption

A plane section which are normal to the neutral axis before bending remain plane even after bending.
It means strain varies linearly over the cross-section.

Validity of Bernoulli's

- Valid for elastic, limit, ultimate theories.
- Valid for prismatic and non-prismatic.
- Valid for shallow beams.

1.2. Reaction

Reaction is the resistance against deformation.

	Numbers (Planar Structure)
• Free end	0
• Roller end	1
• Hinged Support	2
• Fixed Support	3
• Shear hinged – Horizontal & Vertical	2
• Damper	Horizontal Release