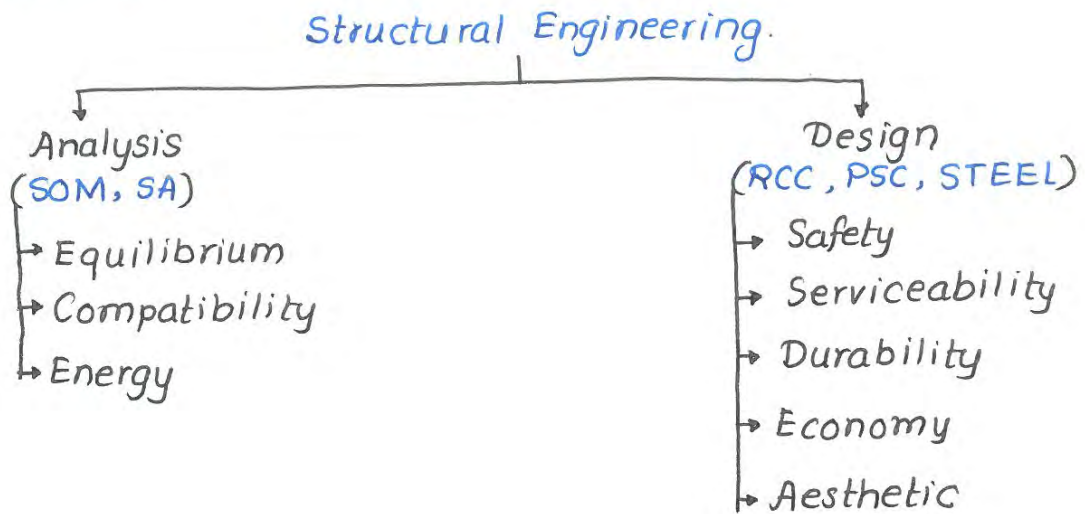


1. Basic Concepts

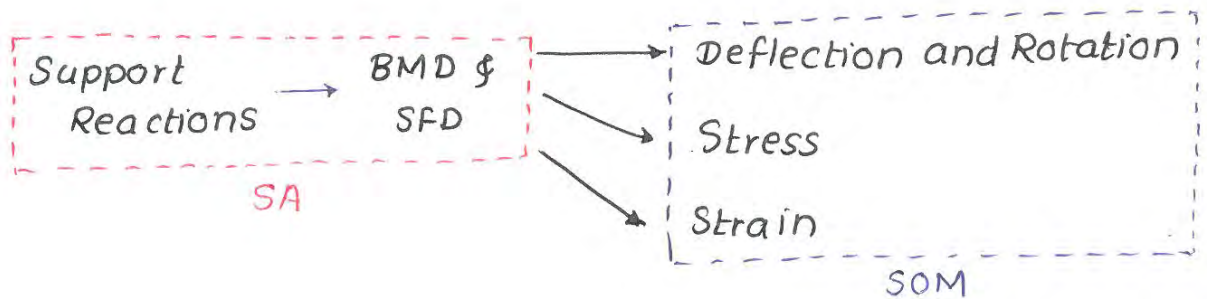
1.1 Introduction:



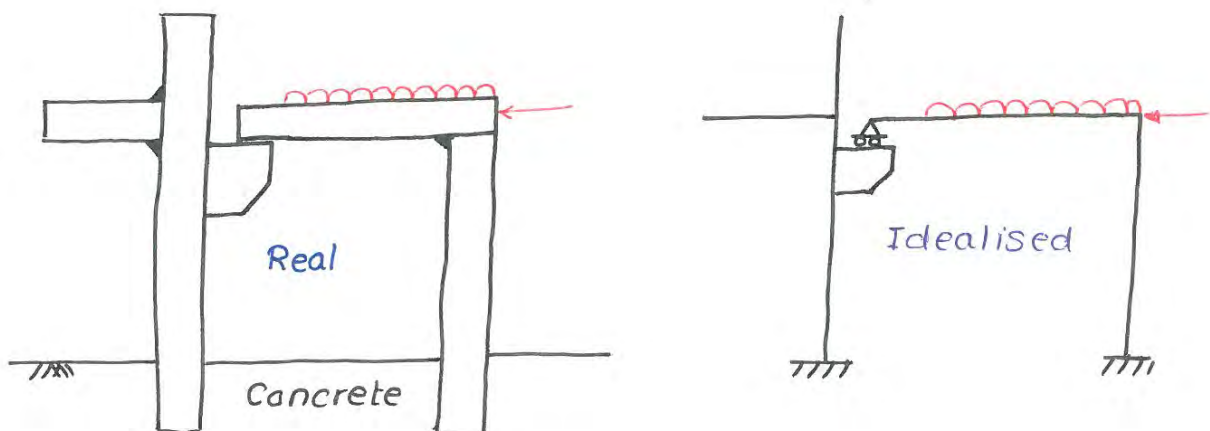
1.2 What is a Structure ?

Any arrangement of members that can transfer load acting upon it to the supports safely can be termed as Structure.

1.3 Meaning of Structural Analysis:



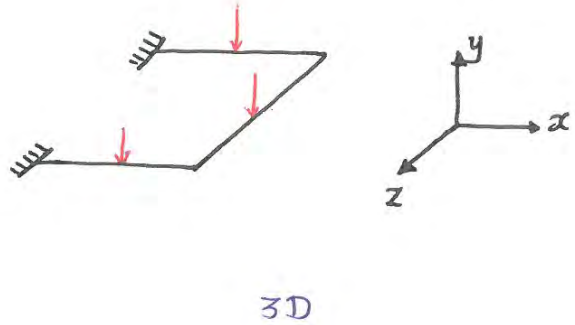
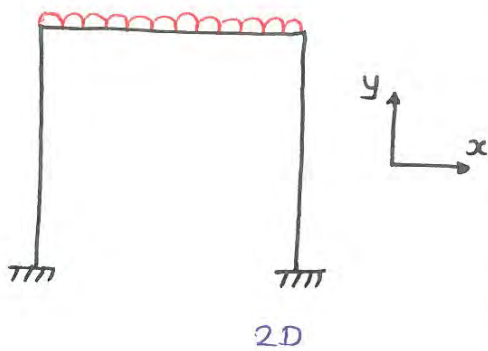
1.4 Idealisation of Structure:



1.5 Planar and 3D Structure:

If 2-axes are sufficient to define geometry and loading of a structure then that structure is called 2D structure/planar structure.

If 3-axes are required to define geometry and loading of a structure then that structure is called 3D structure.



1.6 Sign Convention:

	Positive
x-axis	→
y-axis	↑
z axis	$\vec{x} \times \vec{y}$
Rotation	Clockwise
Forces	Along axis
Moment	Clockwise
SF	
BM	

1.7 Types of Support:

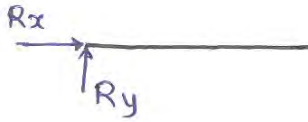
Any arrangement that can restrict movement of any point of a structure is called as support.

Reaction at support is always due to restriction of movement so direction of reaction is always in **opposite direction to expected movement**.

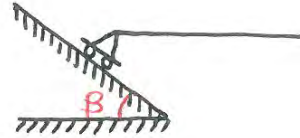
Movement Restricted	Representation	Reaction	Remarks.
$x, y, \text{rotation}$			Fixed
x, y			Pin/Hinge
$y, \text{rotation}$			Guided Roller
$x, \text{rotation}$			Guided Roller
x			Roller
y			Roller
			Inclined Roller.

* Note:

Inclined roller support and hinge support both don't provide any movement in x and y direction but we get one reaction for inclined roller and two reactions for hinge support.



Two unknowns are either (R_x and R_y) or (R and θ)



$$R_x = R \sin \beta$$

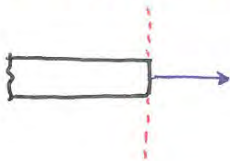
$$R_y = R \cos \beta$$



Unknown is only R because β is known.

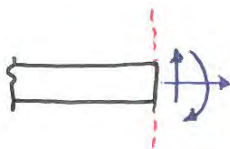
1.8 Types of Structural Member:

1) Axial Member.



Unknown member forces = 1
(Axial Tension or compression)

2) Beam/Frame Member.



Unknown Member forces = 3
(Axial Tension or compression, Shear, Moment)

3) Cable:



Unknown Member Forces = 1
(Axial Tension)