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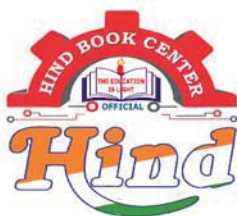
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CIVIL ENGINEERING

CLASS NOTES

STRUCTURAL ANALYSIS

(For all Competitive Exams in INDIA)

VIVEK GUPTA



VIVEK GUPTA

ESE (AIR-10)

GATE (AIR-17)

M. Tech (IIT Delhi, Structure)

This is the class notes of course taught on UNACADEMY PLUS during 05.01.2022 to 25.02.2022 in 80 hours. This course will be very helpful for all students who are preparing for any competitive examination in India.

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A

very special thanks

to all those students who attended this course and suggested well to make this class notes a perfect piece.

Few lovable students who contributed are

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(All names mentioned here are with consent of Individuals)

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CHAPTER – 1

BASIC CONCEPTS

Referral Code
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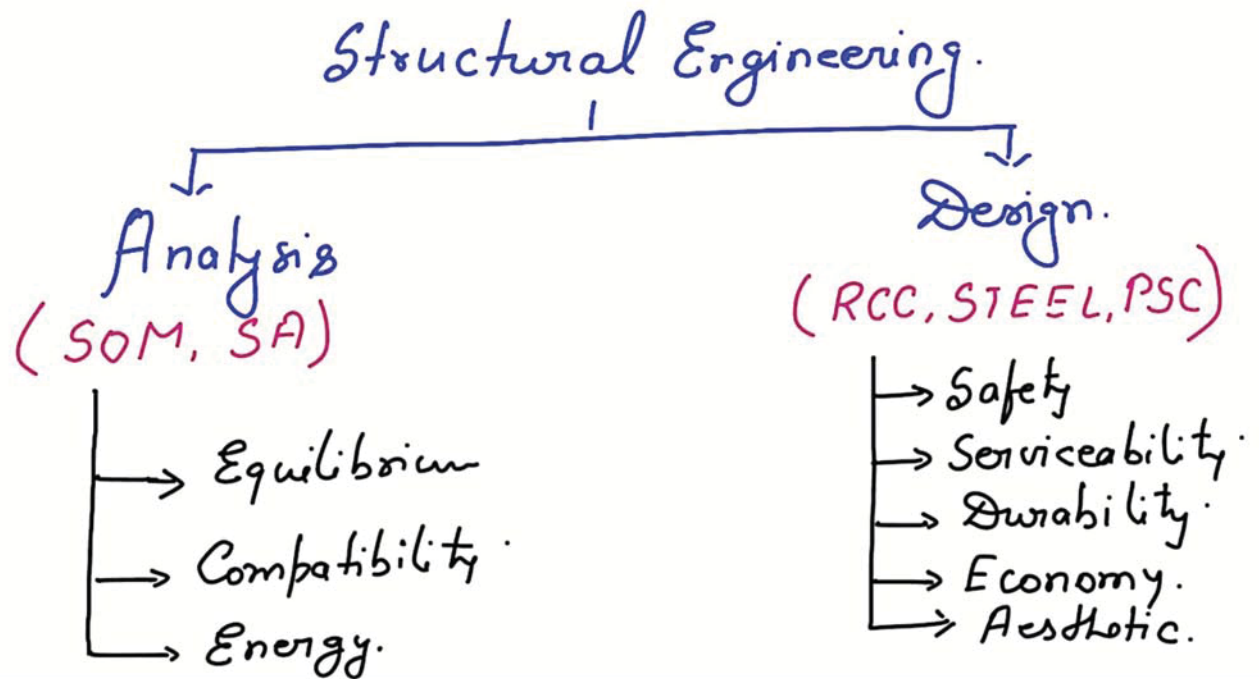
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Recommended Literatures.

- ① My Class Notes.
- ② R.C. Hibbeler, 9th Edition, SI Unit.
- ③ My Workbook.
- ④ PYQ of GATE & ESE

1.1. Introduction.



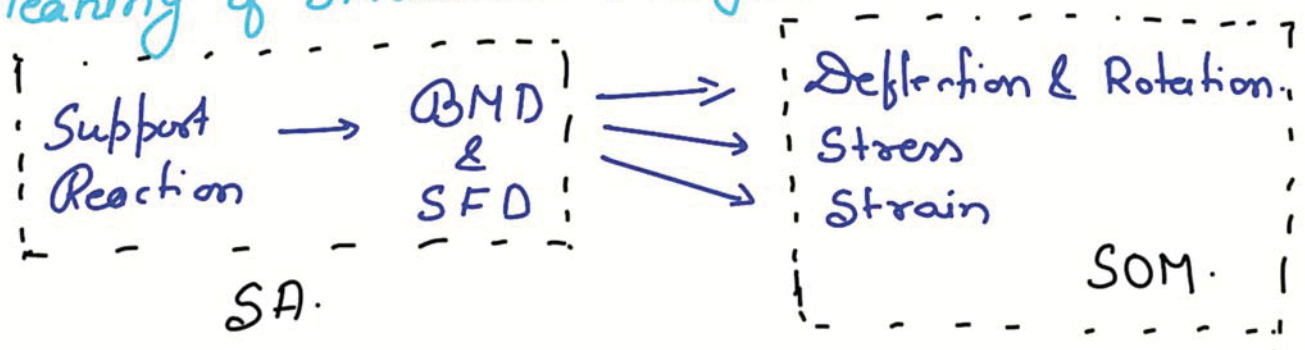
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1.2. What is Structure?

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

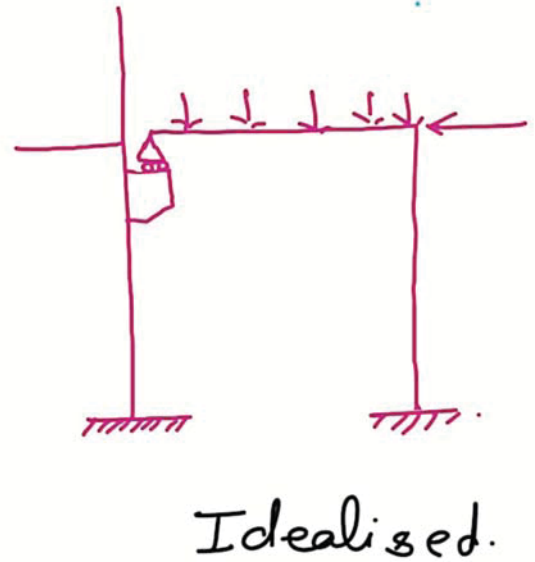
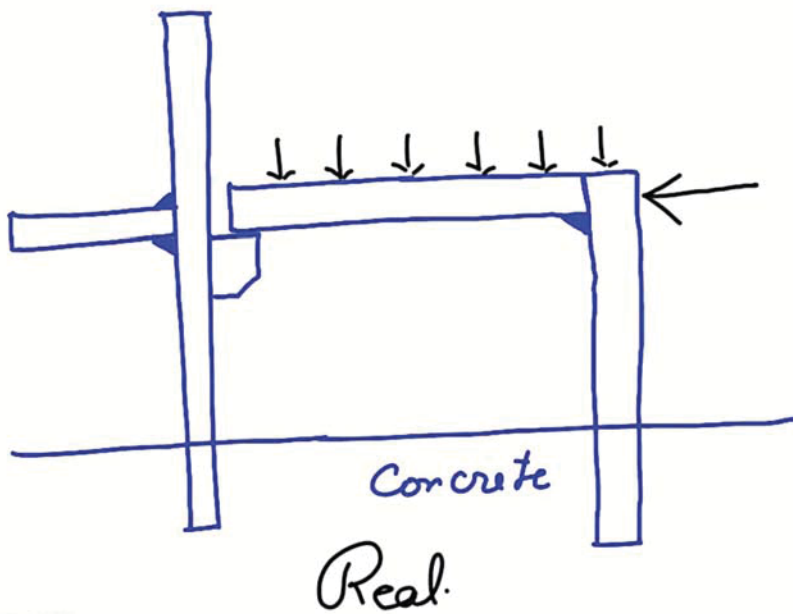
1.3. Meaning of Structural Analysis



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1.4. Idealisation of Structure.

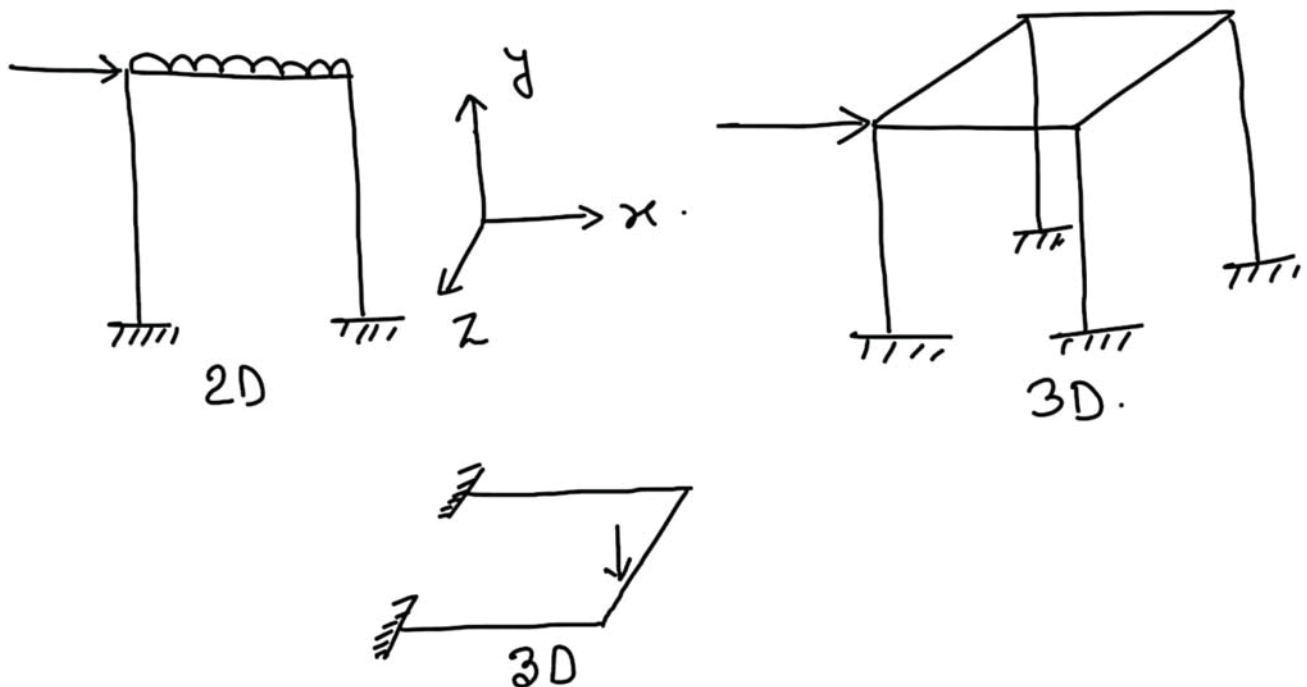


R.C. Hibbeler
Page No — 40.
Fig - 2.5.

1.5 2D & 3D Structure:

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

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



1.6 Sign Convention:

Items.

x -axis

y -axis

z -axis.

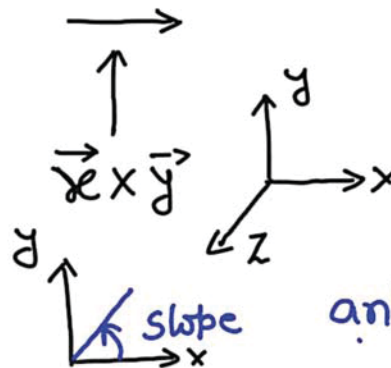
Slope ($\frac{dy}{dx}$)

Rotation

Force

Moment

(+ve) Sign.



clockwise.

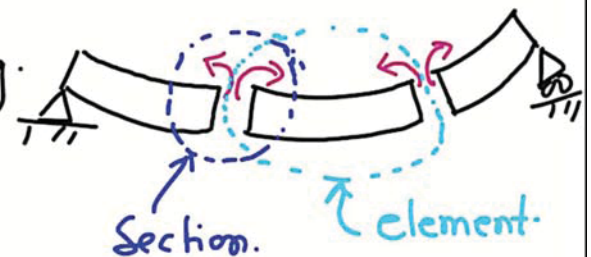
along axis.

clockwise.

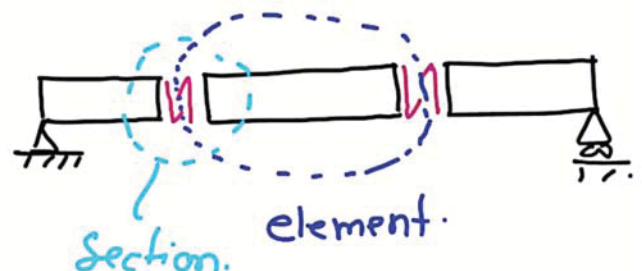
axial force — Tension. (Scalar).



Bending Moment. — Sagging.



Shear force —

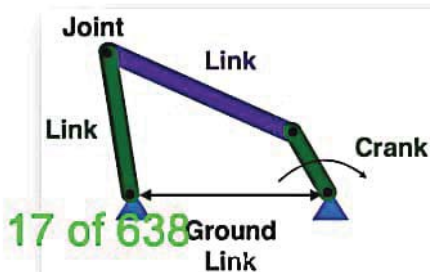


1.7. Types of support.

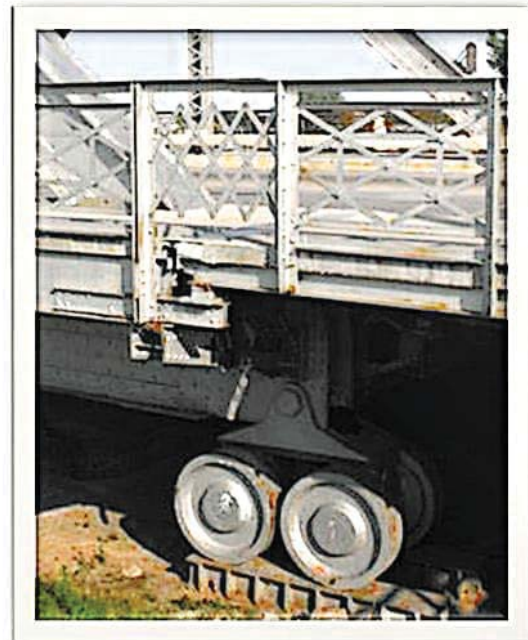
Any arrangement that can restrict movement of any point of a structure is called as support.

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

Hinge support



Roller Support



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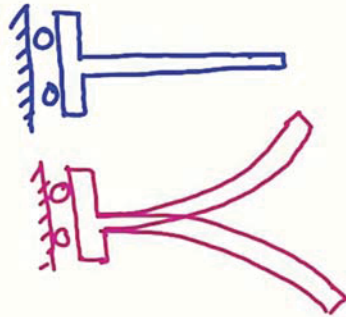
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Movement Restricted	Representation	Reaction	Remarks
$x, y, \text{rotation}$			Fixed
x, y			Pin, hinge
$y, \text{rotation}$			Guided roller

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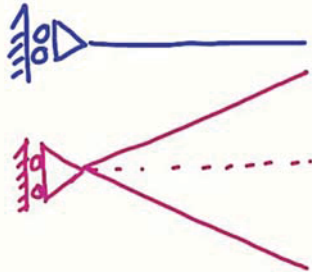
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rotation, α



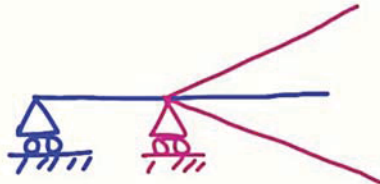
Guided roller.

α



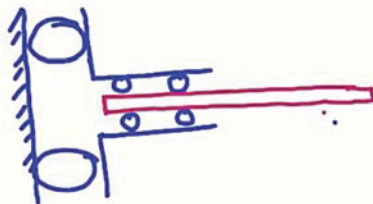
Roller

y



Roller.

rotation



R.C. Hibbeler.

Page No. 36. Fig 2.2, 2.3.

39. Table 2.1.

