AR6301 : Mechanics of Structures II

Unit 1 –Shear Force and Bending Moment

Lecture 1

FAQs

Explain the load distribution in a structure.

In a structure, the live loads and dead loads will be initially supported by the slabs which in turn transmit the same to supporting beams. The beams will get their proportion of loads from slab and transfer the same to supporting columns. The columns will be accepting their proportion and transfer to the footing or foundation supporting them.

Define a beam

A beam is a horizontal element in a structure which is intended to support the walls or portions above it and also to get the load from slab and transmit to supporting columns.

What are the different types of beams?

The beams are classified as

- Cantilever beams
- Simply supported beams
- Over hanging beams
- Propped cantilever beams
- Fixed beams and

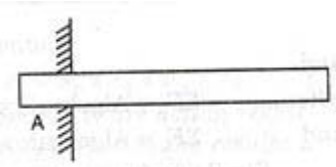
- Continuous beams

List the different types of supports

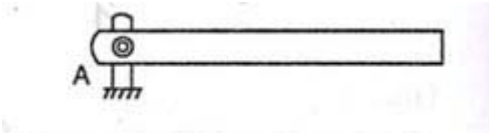
- Fixed supports
- Hinged supports
- Roller supports

What are the reactions offered by supports?

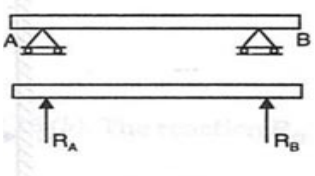
A fixed support will offer three reactions namely, vertical reaction V_A, horizontal reaction H_A and a moment M_A. The physical meaning is that a fixed support won't allow the joint to move either vertically or horizontally and also there won't be any rotation.



A hinged support will be having two reactions namely vertical reaction V_A and horizontal reaction H_A. The physical meaning is that a hinged support won't allow the joint to move either vertically or horizontally. However, it allows for rotation. Eg. A door hinge



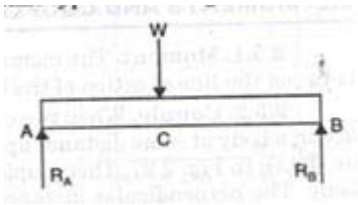
A roller support will offer only one reaction, ie. Reaction perpendicular to the axis of rollers. A roller support won't alow



Explain the different types of loadings

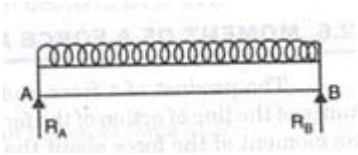
Concentrated load or Point load

A load which is concentrated at a point or applied at a point is called concentrated or point load ‘W’ as shown in Fig.



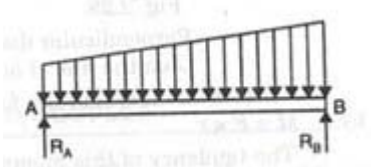
Uniformly Distributed load

If each unit length of a beam carries same intensity of load, the load is said to be uniformly distributed which is abbreviated as udl. The unit of udl is such kN/m (force per unit length)



Uniformly varying load

If the rate of loading of each unit length varies uniformly over the length of the beam, the loading is said to be uniformly varying load which is abbreviated as uvl.



Define Shear Force

Shear force at any section or point is defined as algebraic sum of vertical forces acting either to the left or right of the section or point of a beam.

In case of point load, Shear Force = Force acting either to the left or right of the section considered

In case of uniformly distributed load (udl) , shear force = intensity of udl x length of udl

In case of uniformly varying load (uvl), shear force = area of the loading diagram

Define bending moment

Bending moment at any section or point is defined as the algebraic sum of moments produced by forces acting either to the left or right of the section or point of a beam.

In case of point load, BM = Load x distance

Distance is the perpendicular distance between the line of action of the load and the point or section considered

In case of udl, BM = Load x distance

Load = (intensity of udl x length of udl)

Distance = perpendicular distance between the line of action of the load (c.g of the load) and the point or section considered

Explain the sign conventions to be followed for computing shear force and bending moment

Shear Force

Left Up (LU) : +

Left Down (LD) : -

Right Up (RU) : -

Right Down (RD) : +

Hence, with regard to shear force computation, we need to observe whether the force acts upward or downward and also whether the force acts to the left or right of the section

Bending Moment

Left clockwise (LC) : +

Left anticlockwise(LAC) : -

Right clockwise (RC) : -

Right anticlockwise(RAC) : +

Hence, with regard to bending moment computation, we need to observe whether the force produces clockwise or anticlockwise moment and also whether the force acts to the left or right of the section