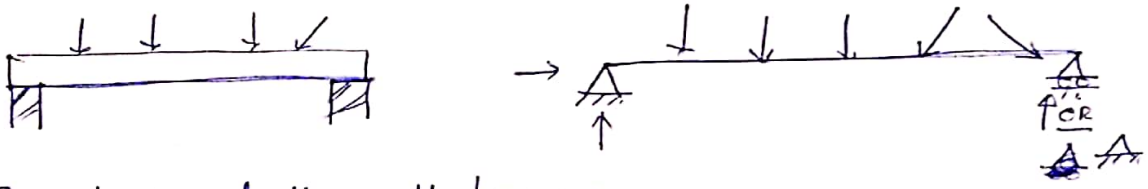
Types of Beam

↳ In a structure, horizontal member which takes transverse load in addition to other loading is called beam

↳ Transverse load means load perpendicular to the length of the beam.

↳ Beam is capable to take all types of loads. i.e. transverse load, tensile load, compressive load, twisting load etc.

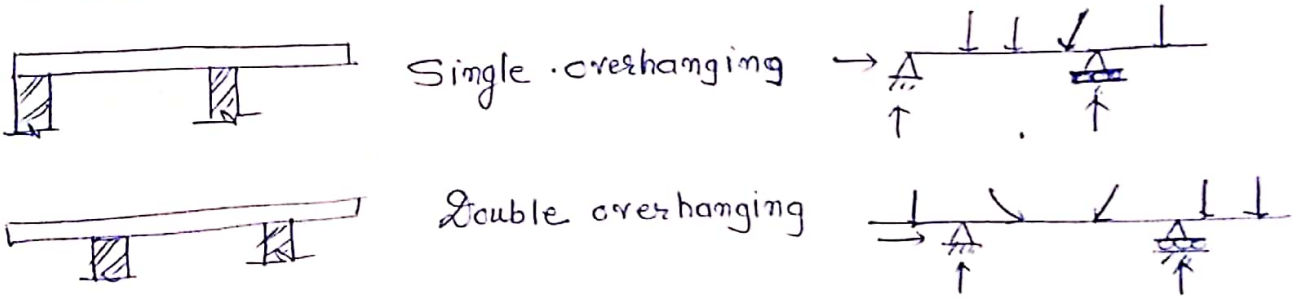
(1) Simply Supported Beam



↳ Simplest of the all beams

↳ supported by a hinge at one end and a roller at the other other end.

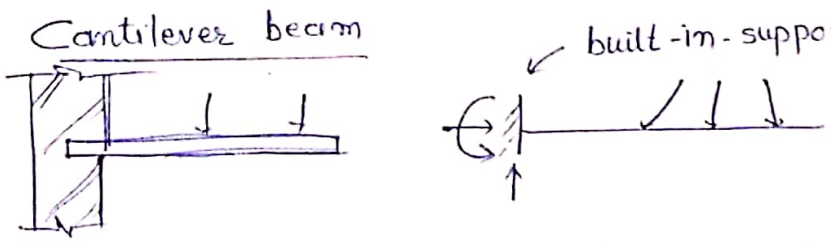
(2) Simply Supported Beam with Overhang:



↳ One end or both the ends of simply supported beam is projected beyond the supports.

↳ The portion of beam extended beyond the roller or hinge supports

(3) Cantilever beam

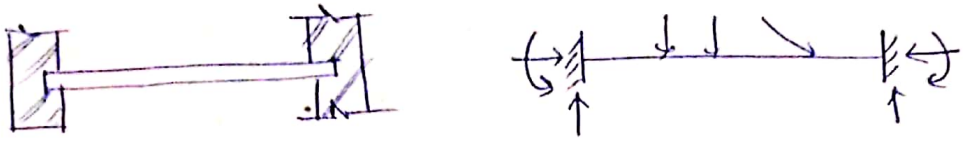


→ does not allow
horizontal linear movement
vertical linear movement
rotational movement

↳ A beam which is fixed at one end and free at the other bar end. Exp. Wall bracket, projected balconies.

↳ One end of the beam cast in concrete and is nailed, bolted, riveted or welded.

(4) Fixed beam



A beam having both ends fixed (built-in supports)

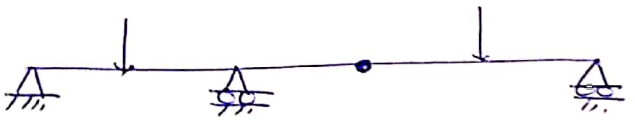
(4) Continuous Beam

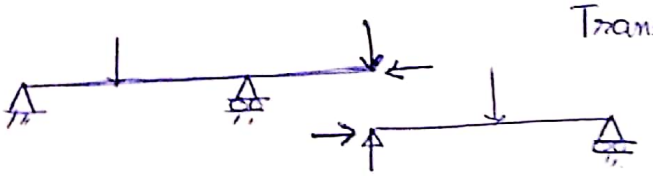
→ A beam which has more than two supports.

→ Ind statically indeterminate beams because reactions can not be obtained by equations of equilibrium.

(5) Beams linked with Internal Hinges

→ Two or more beams are connected to each other by hinge (pin) joints and continuous beam is formed. Such joints are called internal hinge.

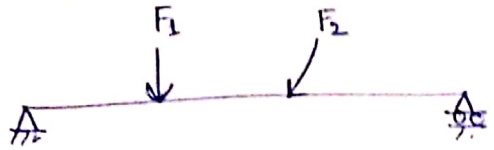




Transfer the forces but does not transfer moment
M will be zero

Types of load

(i) **Point load** : If the whole intensity of load is assumed to be concentrated at a point (It is undefined)



(ii) Distributed Load

→ The concept of a centroid of an area may be used to solve problem dealing with a beam supporting a distributed load.

→ The load ~~my~~ may consist of the weight of materials supported directly or indirectly by the beam

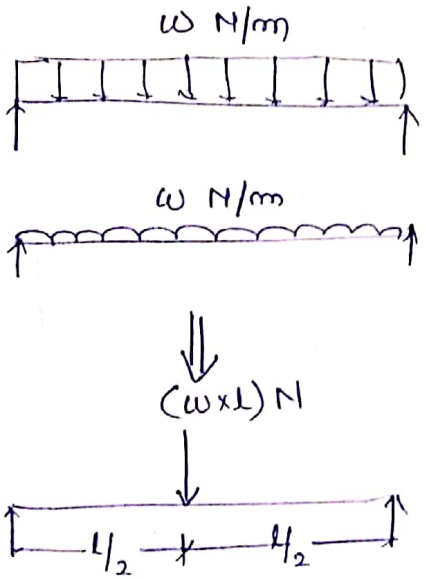
→ It may be caused by wind or hydraulic pressure.

→ Load intensity W supported per unit length.

→ Unit N/m or kNm

→ ~~Exp.~~ ~~Slab~~, ~~etc.~~

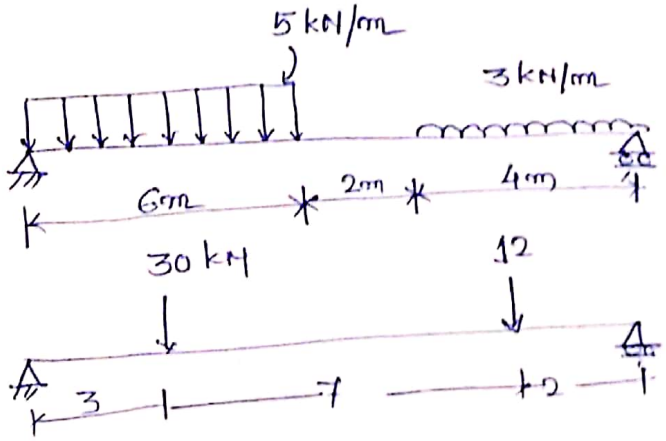
⇒ Uniformly Distributed load (UDL)



→ whole intensity of load is distributed uniformly along the length of loading ⟶ UDL

Exp. → A truck loaded with sand of equal height

→ Slab of a building flooring

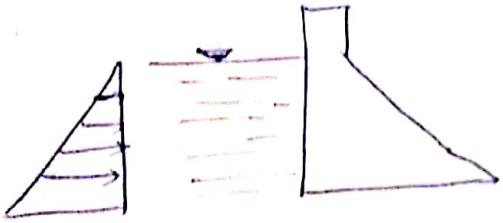


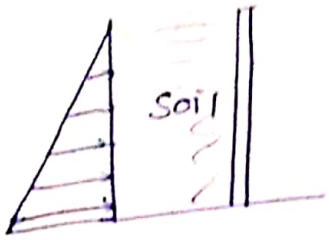
⇒ Uniformly Varying Load (UVL)

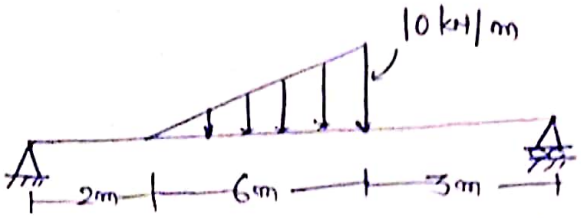
→ If the whole intensity of load is distributed uniformly at varying rate along the length of loading → UVL

Exp. A truck loaded with sand

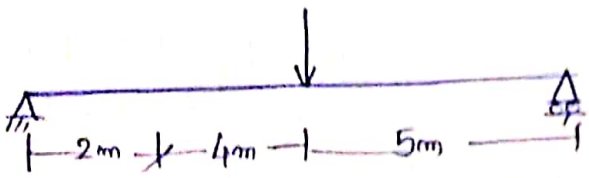
Hydraulic pressure varies linearly with the depth, Soil pressure on retaining wall

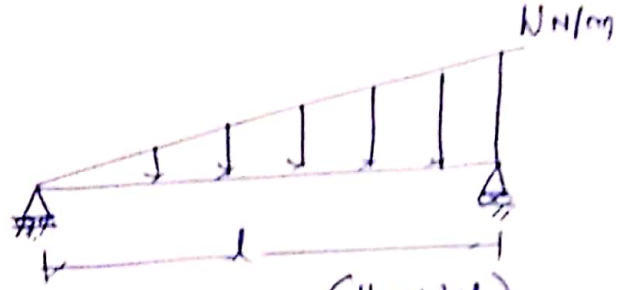




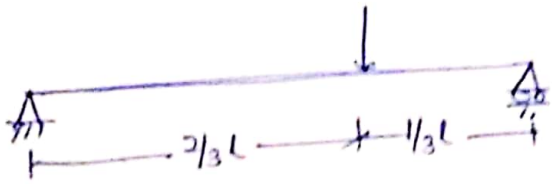


$(\frac{1}{2} \times 10 \times 6) = 30$ kN

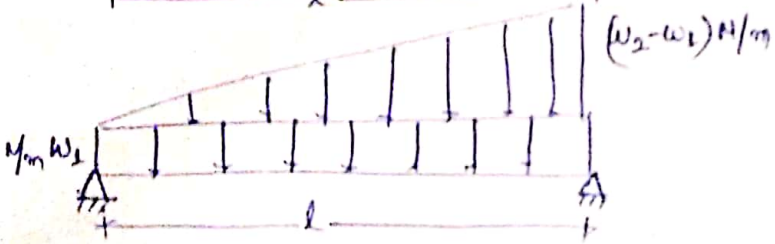


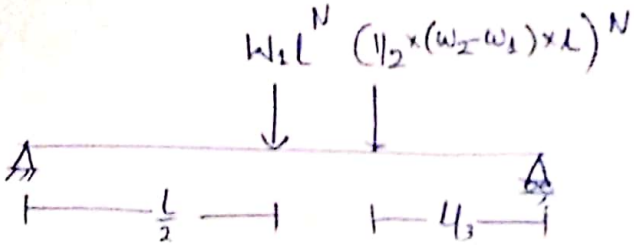


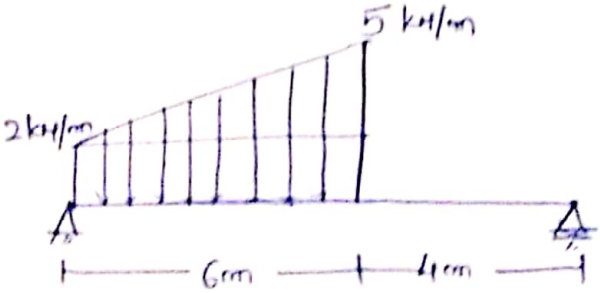
$(\frac{1}{2} \times W \times l)$

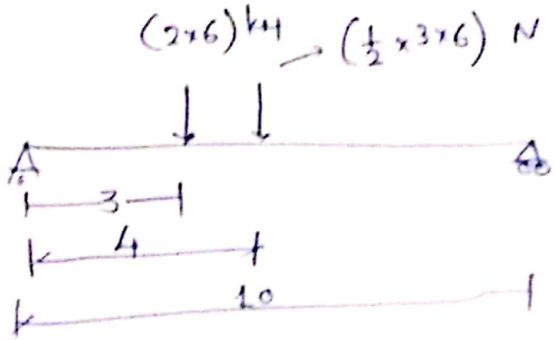


⇒ UDL and UVL combined







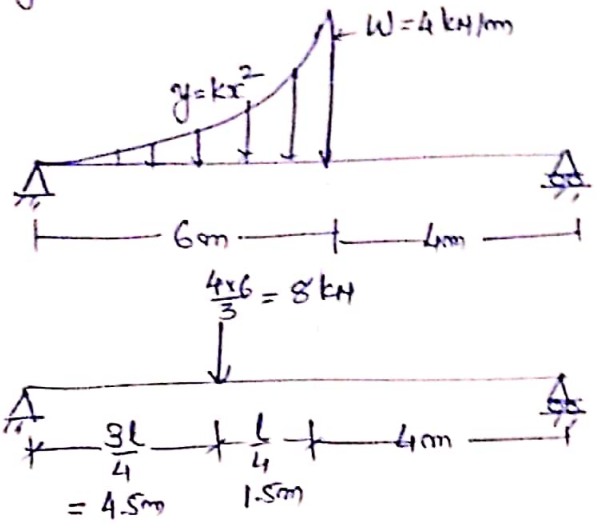


Varying Load with some relation

→ The varying load is given by some relation say parabolic, cubic

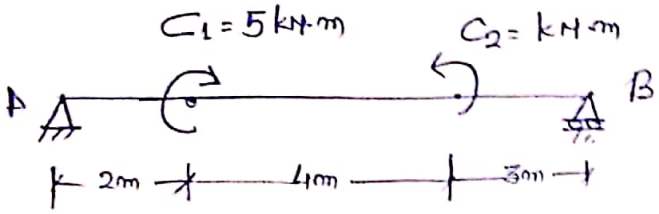
→ It can be replaced by point load.

→ The magnitude of the equivalent point load is equal to the area under loading diagram and it acts through the centroid.



Area = $\frac{Nl}{3}$

⇒ Couple



→ Couples C_1 & C_2 are shown at specific positions.

→ Couple is a free vector → so it can act anywhere along the beam i.e. distances are not significant

$\Sigma M_A = -5 + 7 = 2$ kN·m

$\Sigma M_B \neq 5$