UNIT- II

"LAW OF FORCES"
(बलों के नियम)

FORCE :-

A Force is any interaction that, when unopposed will change the motion of the object.

Has magnitude and direction. Hence, it is vector quantity.

⇒ Newton's 1st law gives the Concept of force.

UNITS :-

(1) F.P.S.

Force → Pound

→ Pound × $\frac{Foot}{Sec^2}$ ⇒ Poundal.

(2) C.G.S.

Force → gram

→ Gram × $\frac{cm}{Sec^2}$ ⇒ Dyne

(3) M.K.S.

Force → Kg.

→ Kg-$\frac{m}{Sec^2}$ ⇒ Newton

(4) S.I.

Force → Newton.

* Representation of Force → (F)
unit → N

NOTE:- → 1 N = 10^5 Dyne

→ 1 N = 1 $\frac{Kg-m}{Sec^2}$

→ 1 pound = 453.592 gram = 0.4535 Kg

EFFECTS OF FORCE :-

(i) Try to pull (or) push a body.

(ii) Try to generate linear Motion in a body.

(iii) Try to rotate a body about an axis (or) point. Generate rotational Motion, called moment of force.

(iv) ↺ A.C.W. → ⊕ve

↻ C.W. → ⊖ve.

(v) Try to deform the body (Internal effect of force).

CHARACTERISTICS OF FORCE :-

(1) **Magnitude :-** Can be represented by N, Dyne, gram-Weight, Kg-Weight.

(2) **DIRECTION :-**

In which the force is acting.

Up (↑), down (↓), Left (←), Right (→)

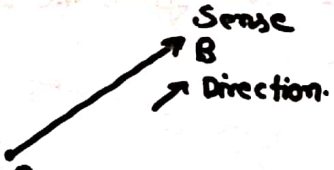
Any Angle.

(3) **point of Application :-**

The point at which, the force is acting.

(4) **Line of Action of force :-**

Direction of force, Sense and point of application is represented through line of Action of force.

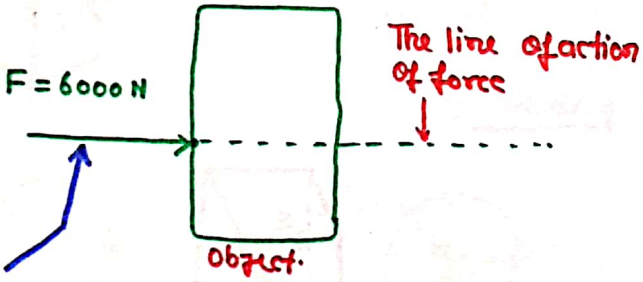


length of OB ⇒ Magnitude.

TYPES OF FORCE :-

(1) POINT FORCE (or) CONCENTRATED FORCE :-

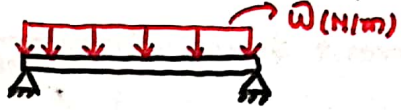
- A point force is any force where the point of application is considered to be a single point.
- In reality Most forces are surface forces.



A vector representation of a point force.

(2) UNIFORMLY DISTRIBUTED FORCE :-

The Magnitude of force / Load remains uniform throughout the whole element. (Beam, Slab)



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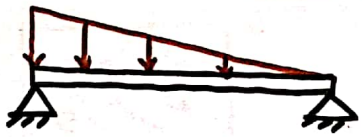
(3) UNIFORMLY VARYING FORCE :-

Force / Load is zero at one end and increase uniformly to the other end.



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