

Ch. 3:- Equilibrium

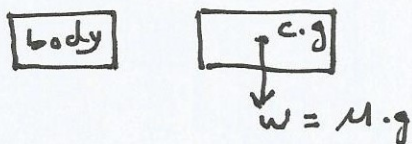
* Equilibrium:- A situation or condition of body when a system of forces acting on it has resultant equal to zero.

* Newton's first law of motion states that if the resultant force acting on a particle is zero, the particle will remain at rest or move with a constant velocity.

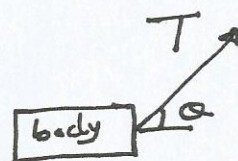
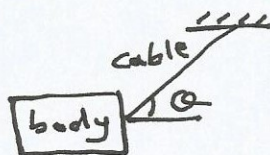
* Free Body Diagram (F.B.D.):- A sketch of a body, a portion of a body completely isolated or free from all other bodies, showing the forces exerted by all other bodies on the one being considered.

* Types of supports:-

① Mass of a body:-

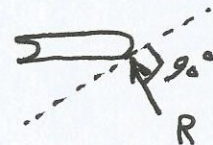
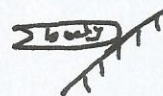
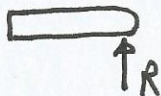


② cable, cord, rope, strand:-



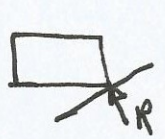
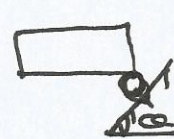
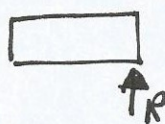
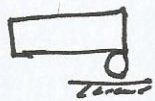
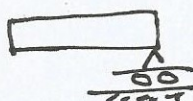
single force along the cable (tension)

③ Smooth surface:-



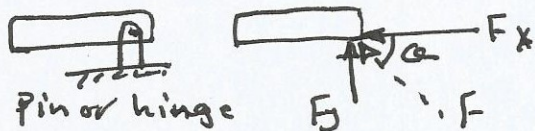
single force perpendicular to the smooth surface.

④ Roller or ball:-



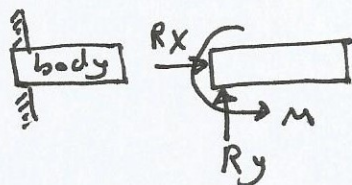
single force perpendicular to the surface on which roller or ball can move.

⑤ Smooth pin or hinge:-

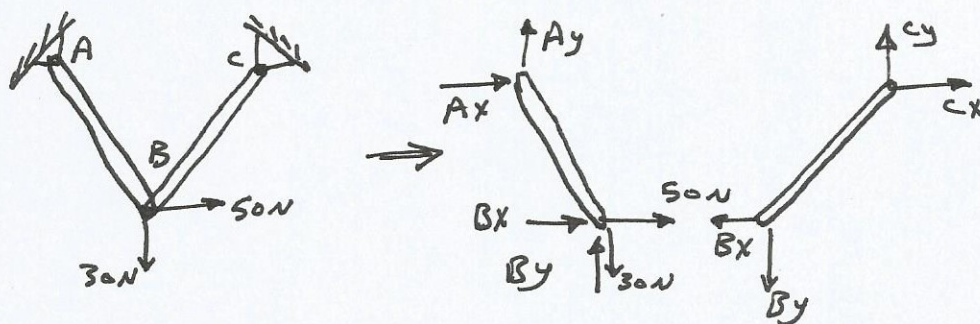


force through the pin at two unknown angle, usually shown as two perpendicular components.

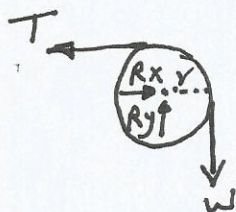
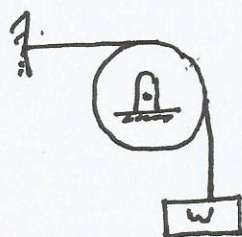
⑥ Fixed support:-



⑦ smooth pin with additional forces on pin:-

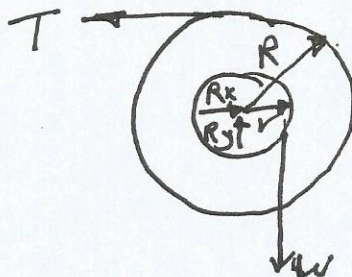
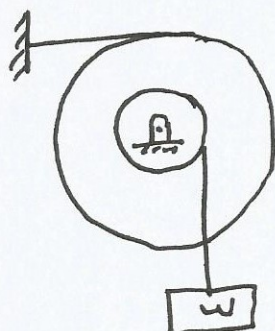


⑧ Pulleys:-



$$w \cdot r = T \cdot r$$

$$w = T$$



$$w \cdot r = T \cdot R$$

$$\therefore T = \frac{r}{R} w$$

Ex. No. 1:- Body A shown in figure weighs 300N and the homogeneous bar B weighs 60N . Draw a free body diagram of each of the two bodies?

