- Free body diagram :-

Equilibrium - State of balance.

Equilibrium of forces - All the forces acting on body are balanced then forces are in equilibrium.

Equilibrium of body :- Body having zero effect under the action of applied forces, then body will be in equilibrium and applied forces are also in equilibrium.

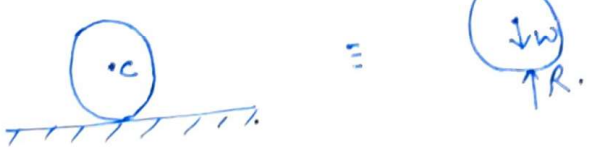
[redacted] :-

Active force :- External force, that try to move the body.

Reactive force :- Force, that try to oppose the motion of the body

F.B.D :- F.B.D is the diagram of the body after seperating all supports. (wall, floor etc.) and all contacts & represent all active and reactive forces applied on it, if the body is in equilibrium.

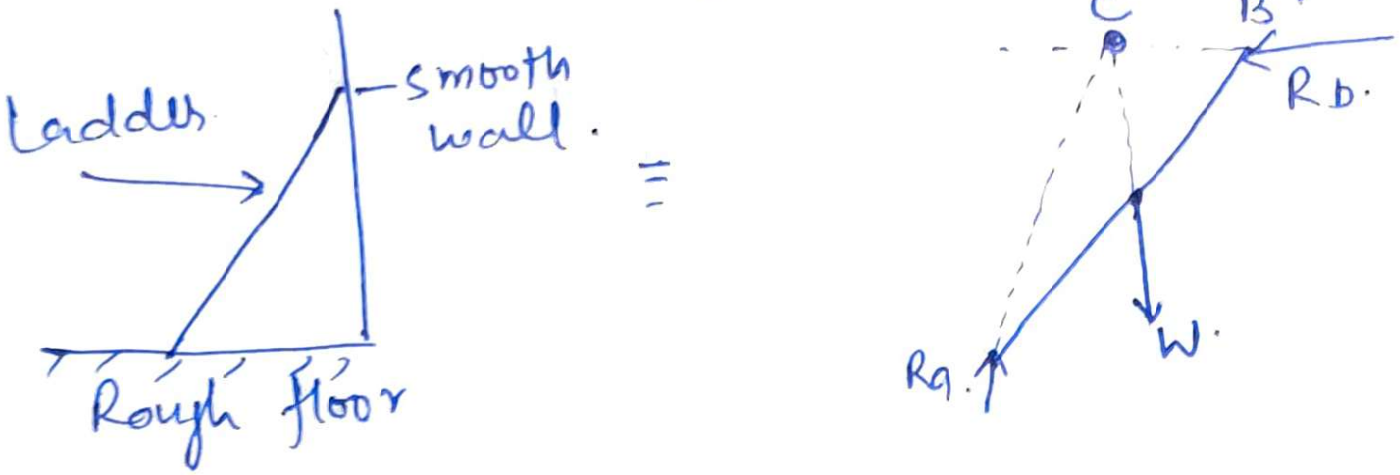
(case I). A sphere resting on a frictionless plane surface



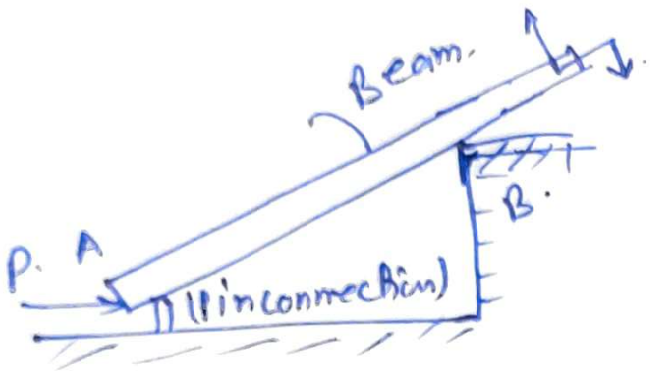
II) A circular roller of weight W hangs by a string and rests against a smooth vertical wall

III) A drum being rolled along the horizontal comes across a steapped obstacle.

(IV) A uniform ladder of weight W leans against a smooth wall and rests on a rough floor :-



V) A beam loaded & supported!



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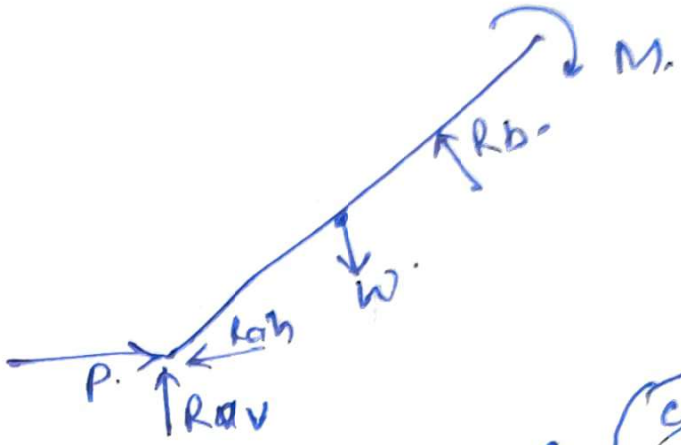
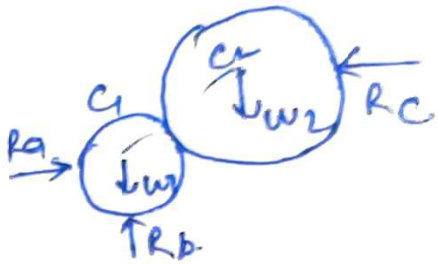
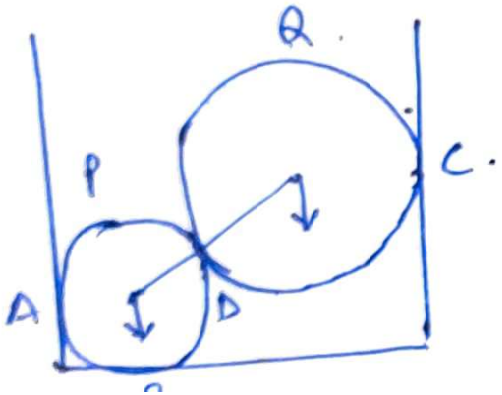




VI). Two sphere P & Q placed in a vessel!.



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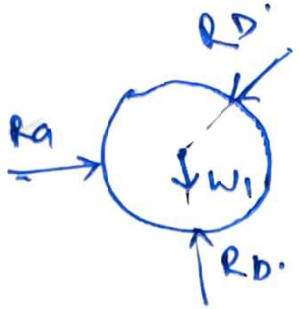

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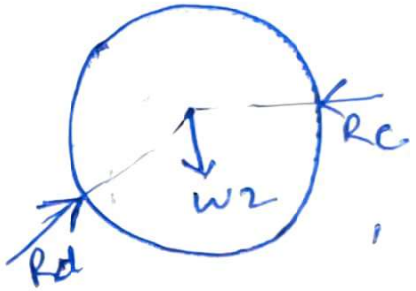

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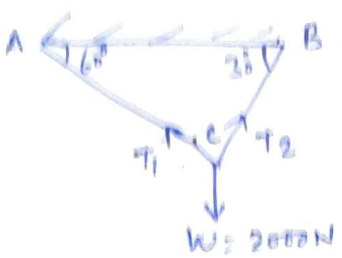
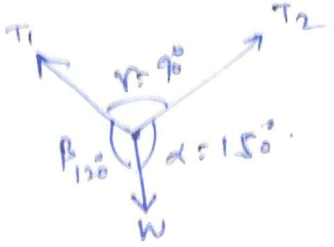
Q.

(21) A weight of 2000 N is supported by two chain AC & BC as shown in fig. Determine the tension in each chain.

Soln:



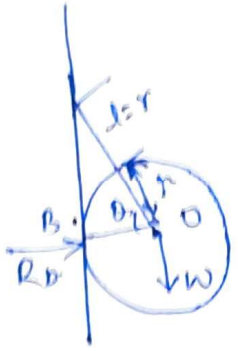


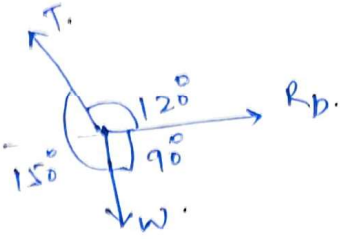
$$\frac{T_1}{\sin\alpha} = \frac{T_2}{\sin\beta} = \frac{W}{\sin\gamma}$$

$$T_1 = 2000 \times \frac{\sin 150}{\sin 90} = 1000\,N$$

$$T_2 = 2000 \times \frac{\sin 120}{\sin 90} = 1732\,N.$$

(22) A smooth sphere of radius 15 cm and weight 2 N is supported in contact with a smooth vertical wall by a string whose length equal to radius of sphere. The string joins a point on the wall and a point on the surface of sphere. Find the inclination & tension, reaction of the wall





$$\cos\theta = \frac{OB}{OA} = \frac{R}{2R} \Rightarrow \theta = 60^\circ$$

$$\frac{T_B}{\sin 90} = \frac{W}{\sin 120} = \frac{R_B}{\sin 150}$$

$$T = \frac{\sin 90}{\sin 120} \times W = 2 \times \frac{1}{.866} = 2.31\,N$$

$$R_B = W \times \frac{\sin 150}{\sin 120} = \frac{2 \times .5}{.866} = 1.15\,N.$$