



EQILIBRIUM OF RIGIDBODIES – SUPPORT REACTIONS

Beam:

A beam is a horizontal structural member which carries a load, transverse (perpendicular) to its axis and transfers the load through support reactions to supporting columns or walls.

Frame:

A structure made up of several members, riveted or welded together is known as frame.

Support reactions of Beam:

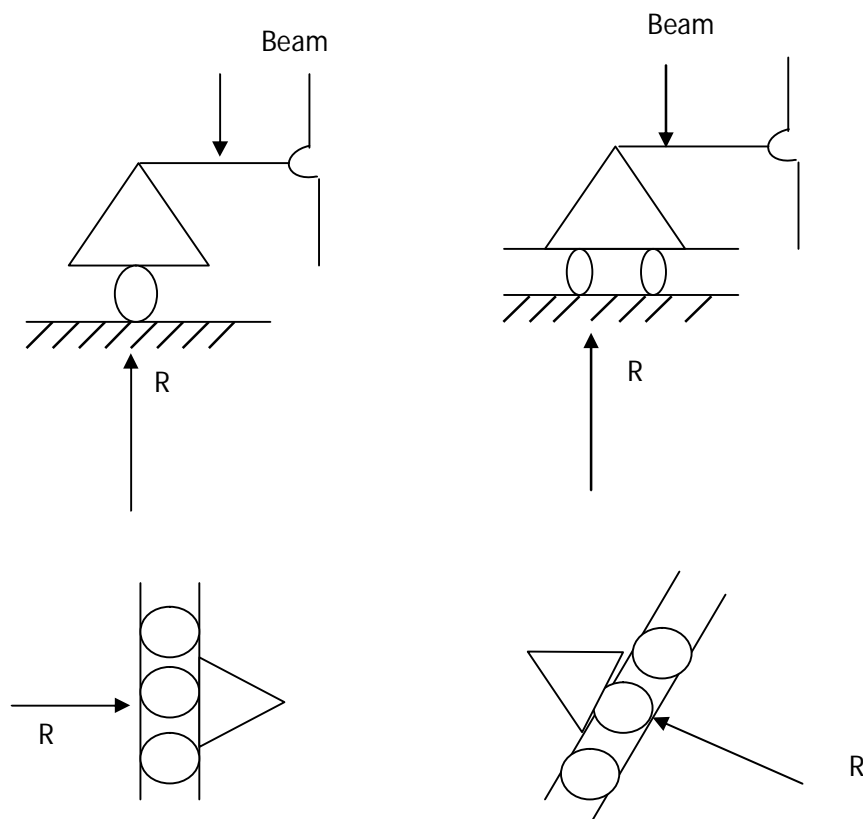
The force of resistance exerted by the support on the beam is called as support reactions.

- Support reaction of beam depends upon the type of loading and type of support.

Types of Supports

1. Roller support
2. Hinged support
3. Fixed support

1. Roller support:





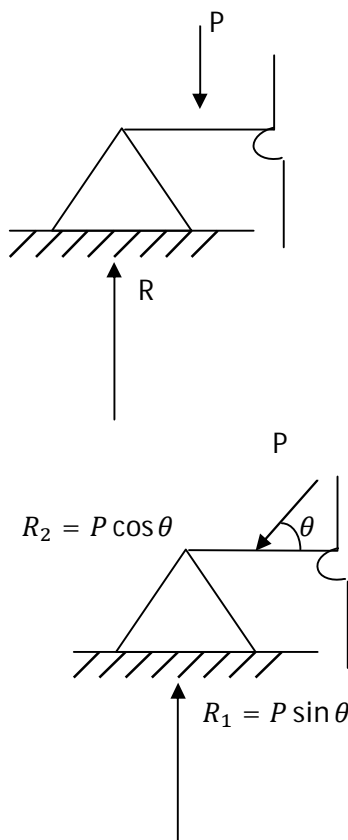
This type of support cannot withstand any force parallel to its own plane. This support will simply roll off if there is some parallel force to its plane. Hence, the roller support has only one reaction.

2. Hinged support:

This type of support can withstand any type of both horizontal and vertical. Hence it has two reaction components, vertical and horizontal.

It is to be noted that if the load is vertical, even though it can offer two reaction forces, in this particular case, the reaction will be vertical only. Its horizontal reaction is zero.

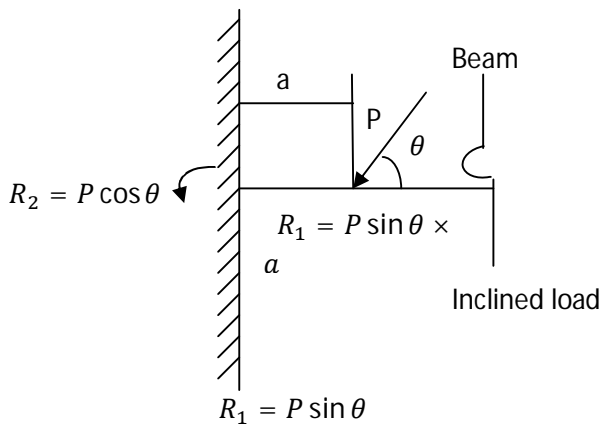
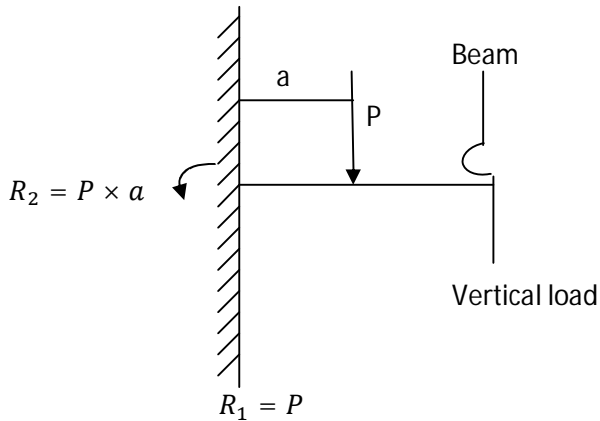
But if the load is inclined then the reaction will also be inclined i.e. resolving we get vertical and horizontal components.



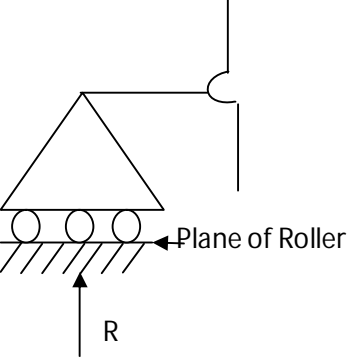
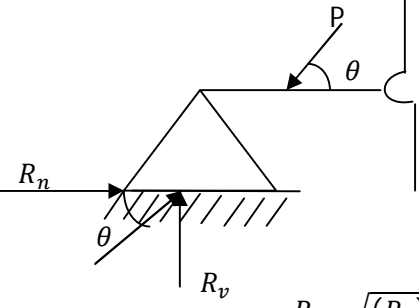
It is also called Pin – Joint support.

3. Fixed support

Both roller and hinged supports can resist only displacement (i.e. vertical and horizontal movement of beam at ends) but rotation of the beam is resisted by both the supports. This can be given by the fixed supports. Hence, fixed support has three reaction components, horizontal reaction, vertical reaction and rotational reaction. Fixed support is considered as the strongest support.



Comparison between Roller support and Hinged support

 <p>Plane of Roller</p> <p>R</p>	 <p>$R = \sqrt{(R_n)^2 + (R_v)^2}$</p> <p>$\theta = \tan^{-1} \left(\frac{R_v}{R_n} \right)$</p>
<p>Roller support has the known line of action i.e. always normal to the plane of rollers.</p>	<p>Hinged support has an unknown line of action of reaction i.e. at any angle θ with horizontal.</p>
<p>R can be resolved b its two components R_n, R_v $(\sum H = 0, \sum V = 0$ for solving problems)</p>	