SUPPORT AND REACTION

In our day-to-day work, we see that whenever we apply a force on a body, it exerts a *reaction, *e.g.*, when a ceiling fan is hung from a girder, it is subjected to the following two forces:
1. Weight of the fan, acting downwards, and
2. Reaction on the girder, acting upwards.

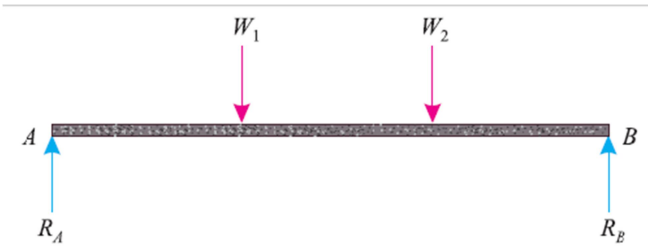
The upward reactions, offered by the walls, are known as support reactions. As a matter of fact, the support reaction depends upon the type of loading and the support.

TYPES OF LOADING

Though there are many types of loading, yet the following are important from the subject point of view :
1. Concentrated or point load,
2. Uniformly distributed load,
3. Uniformly varying load

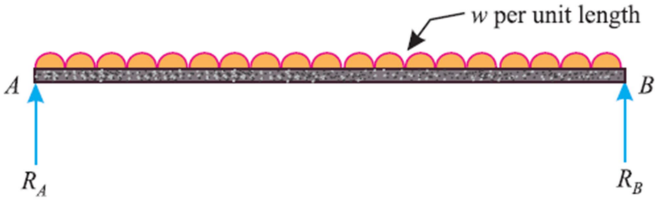
CONCENTRATED OR POINT LOAD

A load, acting at a point on a beam is known as a *concentrated or a point load* as shown in Fig.



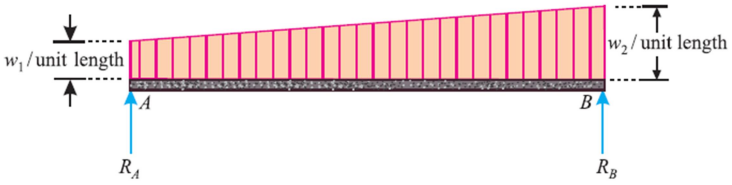
UNIFORMLY DISTRIBUTED LOAD

A load, which is spread over a beam, in such a manner that each unit length is loaded to the same extent, is known as *uniformly distributed load* (briefly written as U.D.L.) as shown in Fig. The total uniformly distributed load is assumed to act at the centre of gravity of the load for all sorts of calculations.



UNIFORMLY VARYING LOAD

A load, which is spread over a beam, in such a manner that its extent varies uniformly on each unit length (say from w_1 per unit length at one support to w_2 per unit length at the other support) is known as *uniformly varying load* as shown in Fig. Sometimes, the load varies from zero at one support to w at the other. Such a load is also called triangular load.

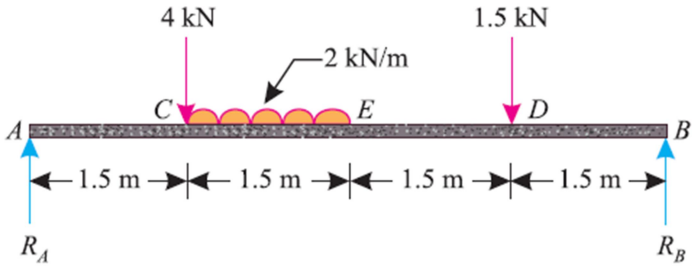


TYPES OF END SUPPORTS OF BEAMS

Though there are many types of supports, for beams and frames, yet the following three types of supports are important from the subject point of view:

1. Simply supported beams,
2. Roller supported beams, and
3. Hinged beams.

Q. A simply supported beam, AB of span 6 m is loaded as shown in Fig. Determine the reactions R_A and R_B of the beam.



Solution. Given: Span (l) = 6m

Let R_A = Reaction at A, and R_B = Reaction at B.

The example may be solved either analytically or graphically. But we shall solve it analytically only.

We know that anticlockwise moment due to the reaction R_B about A.

$$= R_B \times l = R_B \times 6 = 6\ R_B \text{ kN-m}$$

and sum* of the clockwise moments about A

$$= (4 \times 1.5) + (2 \times 1.5)\ 2.25 + (1.5 \times 4.5) = 19.5 \text{ kN-m}$$

Equating anticlockwise and clockwise moments

$$6\ R_B = 19.5$$

$$\boldsymbol{R_B = 3.25 \text{ k.N}}$$

And

$$R_A = 4 + (2 \times 1.5) + 1.5 - 3.25$$

$$\boldsymbol{R_A = 5.25 \text{ kN}}$$