

Define moment of force and principle of moments

Moment of force:

The moment of a force or torque, r is defined as the turning effect of the force about a pivot and is the product of the force (F) and the perpendicular distance (d) from the line of action of the force to the pivot. SI unit of moment of a force is Newton-metre (Nm). It is a vector quantity

The moment formula is given by. Moment of force = $F \times d$. Wherein, F is the force applied, and d is the distance from the fixed axis

The moment of the force measures the tendency of the rotation of the body along any axis, whether it be the centroid axis of the body or any of the outside axis. The couple **moment** is produced by two forces, not by a single force. The total work done is the dot product of force and distance not the cross

Principle of moments:

The principle of moments states that when in equilibrium the total sum of the anti clockwise moment is equal to the total sum of the clockwise moment. When a system is stable or balance it is said to be in equilibrium as all the forces acting on the system cancel each other out.

The Principle of Moments states that when a body is balanced, the total clockwise moment about a point equals the total anticlockwise moment about the same point. Moment =force $F \times$ perpendicular distance from the pivot d .

Define equilibrium and its types

Equilibrium:

An equilibrium is a state of a system where all forces acting on the system is balanced. A system that is in equilibrium does not change. Thermal equilibrium means as much heat is entering and leaving something. Homeostasis is a living thing keeping its internal balance.

Types of equilibrium:

There are three types of equilibrium: stable, unstable, and neutral.

There are three states of equilibrium:

- Stable equilibrium
- Unstable equilibrium
- Neutral equilibrium

Stable equilibrium

When the center of gravity of a body lies below point of suspension or support, the body is said to be in **STABLE EQUILIBRIUM**. For example a book lying on a table is in stable equilibrium

Explanation:

A book lying on a horizontal surface is an example of stable equilibrium. If the book is lifted from one edge and then allowed to fall, it will come back to its original position.

Other examples of stable equilibrium are bodies lying on the floor such as chair, table etc.

Reason of stability:

When the book is lifted its center of gravity is raised . The line of action of weight passes through the base of the book. A torque due to weight of the book brings it back to the original position.

Unstable equilibrium:

When the center of gravity of a body lies above the point of suspension or support, the body is said to be in unstable equilibrium

Example:

pencil standing on its point or a stick in vertically standing position.

Explanation:

If thin rod standing vertically is slightly disturbed from its position it will not come back to its original position. This type of equilibrium is called unstable equilibrium, other example of unstable equilibrium are vertically standing cylinder and funnel etc.

Neutral equilibrium:

When the center of gravity of a body lies at the point of suspension or support, the body is said to be in neutral equilibrium. Example: rolling ball.

Explanation:

If a ball is pushed slightly to roll, it will neither come back to its original nor it will roll forward rather it will remain at rest. This type of equilibrium is called NEUTRAL EQUILIBRIUM.

Q3: Define force and its types

Force:

In science, force is the push or pull on an object with mass that causes it to change velocity (to accelerate). Force represents as a vector, which means it has both magnitude and direction.

A force involves an interaction between two or more objects, and it causes a push or pull between the objects. There is always a direction associated with the force. Good examples of opposing force include drag due to interaction with an air mass and the force due to friction between two objects

The Force can be measured using a spring balance. The SI unit of force is Newton(N).

The quantity of force is expressed by the vector product of mass (m) and acceleration (a). The equation or the formula for force can mathematically be expressed in the form of:

$$F=ma$$

Types of force:

Force is a physical cause that can change the state of motion or the dimensions of an object. There are two types of forces based on their applications:

1. Contact Force
2. Non-Contact Force

Forces which act on a body either directly or through a medium are called contact forces.

Examples of contact forces are:

- Muscular Force

- Mechanical Force
- Frictional Force

Forces which act through spaces without making direct contact with the body are called non-contact forces.

Examples of non-contact forces are:

- Gravitational Force
- Electrostatic Force
- Magnetic Force