Lesson no 4

"TURNING EFFECT OF FORCE"

Q1 Define Following:-

(i) Resultant vector:-

The vector whose effect is same as combined affect of a number of vector, is called resultant vector.

(ii) Torque:-

The torque is equal to "turning effect of force".

(iii) Center of Mass:-

The point at which whole of mass would be connected then motion of this point describes motion of the body, is called centre of mass.

(iv) Center of Gravity:-

The point at which whole of the weight of the body appears to be acting, is called "center of gravity".

Q2 Differentiate the following:

(i) like and unlike force:-

like force act along same direction. And the unlike force act in opposite directions.

(ii) Torque and couple:-

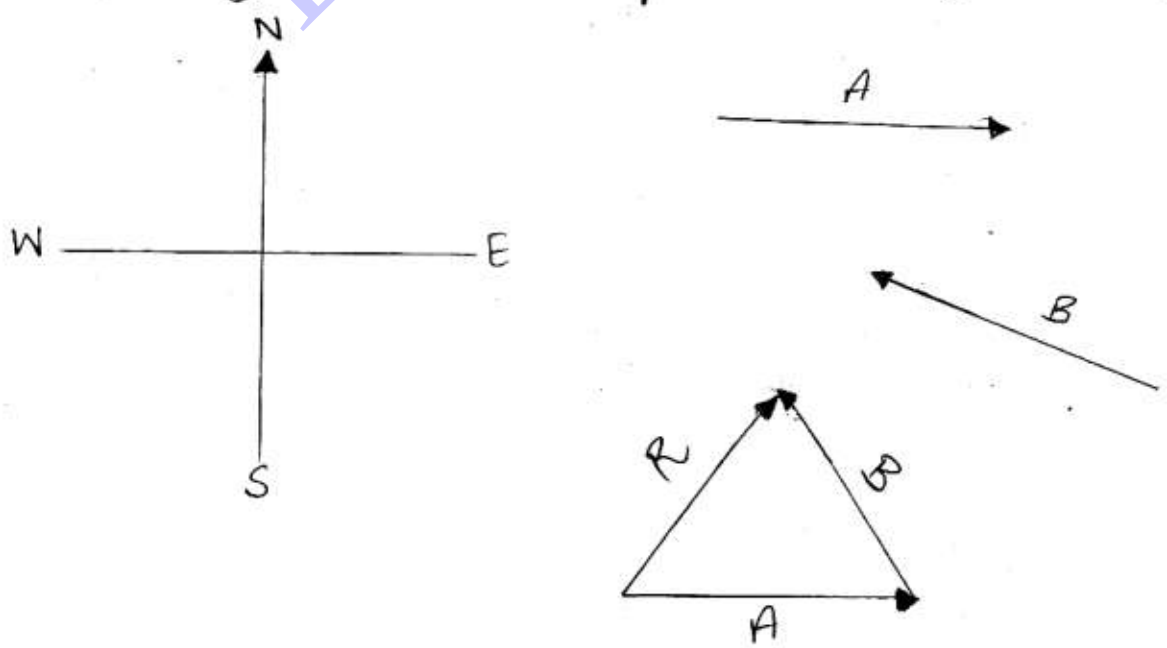
Torque is turning effect of single force. And couple is turning effect of two equal and un-like force, having different lines of their action

(iii) Stable and neutral equilibrium:-

A body stable when line of action of its weight passes within base. And neutral equilibrium is state when line of action of weight does not pass through base.

Q4 How head to tail rule helps to finds the resultant of force?

Ans To explain the head to tail rule of addition of vector helps in following steps



Step I

We select a suitable scale for the graphical representation of vector.

Step II

We draw all the given vectors, one by one, so that tail of next lies on head of first drawn vectors.

Step III

We join the tail of first drawn vector with head of the last drawn vector. The length of line joining gives the magnitude of the resultant, according to same suitable selected scale.

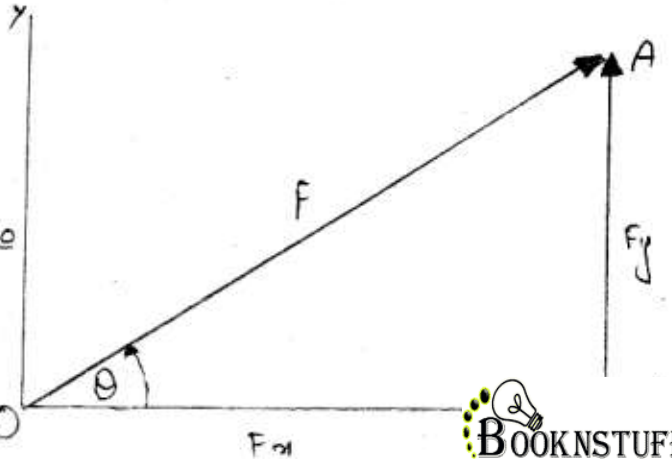
Step IV

The direction of resultant vector is given by measuring angle made by the line joining with a reference axis (+ve x-axis).

Q5) How can a force be resolved into its rectangular components?

Ans: Resolution of a Vector:

When a given vector is drawn graphically. Then it may be split up into <u>two</u> parts which are at 90° to each other. Then each



One of these two parts of same vector are called the "rectangular components".

Let us consider a force, $\vec{F}$, which is represented by straight line OA, in the figure.

The line of representation of force F makes an angle of θ with the direction of +ve x-axis.

From the head of $\vec{F}$, a perpendicular is drawn on x-axis. This is denoted by line AB. It is used to represent y-component of vector, $\vec{F}$, because its direction is parallel to $\vec{y}$-axis. The line OB is used to represent the other component of $\vec{F}$, called x-component. Figure shows that we can write

$$\vec{OA} = \vec{OB} + \vec{BA}$$

Here

$$\vec{OB} = x\text{-component of } F = \vec{Fx}$$

$$\vec{BA} = y\text{-component of } F = \vec{Fy}$$

Q6 When a body is said to be equilibrium?

Ans The body is said to be in equilibrium, when it does not has linear and angular acceleration.

Q7 Explain the first condition for equilibrium

Ans According to first condition of equilibrium the resultant force (or sum of all force) must be zero.

$$\Sigma F = 0$$

Q8 Why there is a need of second condition for equilibrium if a body satisfies first condition for equilibrium?

Ans Two equal and opposite force having their different lines of action form couple, which produce angular acceleration. Although first condition of equilibrium is being satisfied. A body / system is definitely in equilibrium when first, as well as second condition (both) are satisfied.

Q9 What is second condition for equilibrium?

Ans According 2nd condition of equilibrium the total / resultant torque acting on a system must be equal to zero

$$\Sigma \tau = 0$$

Q.10 Give an example of a moving body which is in equilibrium?

Ans A parachuter moving down with uniform velocity is said to in dynamic equilibrium

Q.11 Think of a body which is at rest but not in equilibrium?

Ans:- A ball thrown upward becomes at rest at the top. At this state it is not in equilibrium although it is at rest

Q.12 Why a body cannot be in equilibrium due to single force acting on it?

Ans A single force acting on a body is not balanced and produces acceleration Therefore, in the presence of a single force body can not be in equilibrium.

Q.13 Why the height of vehicals is kept as low as possible?

Ans The height of a vehicles in kept lowest possible, so that its centre gravity remain

close to its base to get more gravity.

Q14. Explain what is meant by stable, unstable and neutral equilibrium. Give one example in each case.

Ans A body is in equilibrium when its rate does not change with time. And a body is unstable when resultant force on it is zero. A body is in neutral equilibrium when its center of gravity remain at same height from surface of earth, while it moves. Example is of a sphere rolling on horizontal surface.

Q1. Encircle the correct answer from the given choices.

Answers:

(i)	b	(ii)	d	(iii)	b	(iv)	d
(v)	c	(vi)	b	(vii)	c	(viii)	c