Unit 4: Turning Effect of Force

Textbook Exercise Questions

4.1 Encircle the correct answer from the given choices.

i. Two equal but unlike parallel forces having different line of action produces:
(a) Torque ✓ (b) couple
(c) Equilibrium (d) neutral equilibrium

ii. The number of forces that can be added by head to tail rule are:
(a) 2 (b) 3
(c) 4 **(d) any number✓**

iii. The number of perpendicular components of forces are: (LHR 2013)
(a) 1 **(b) 2 ✓**
(c) 3 (d) 4

iv. A force of 10 N is making an angle of 30° with the horizontal. Its horizontal component will be:
(a) 4 N (b) 5 N
(c) 7 N **(d) 8.7 N✓**

v. A couple is formed by:
(a) Two forces perpendicular to each other (b) Two like parallel forces
(c) Two equal and opposite forces in the same line
(d) Two equal and opposite forces not in the same line✓

vi. A body is in equilibrium when its:
(a) Acceleration is uniform (b) Speed is uniform
(c) Speed and acceleration is uniform **(d) Acceleration is zero✓**

vii. A body is in neutral equilibrium when its centre of gravity:
(a) Is at its highest position (b) Is at the lowest position
(c) Keeps its height if displaced ✓ (d) Is situated at its bottom

viii. Racing cars are made stable by:
(a) Increasing their speed (b) Decreasing their mass
(c) Lowering their centre of gravity✓ (d) Decreasing their width

4.2 Define the following:

Ans:

(i) Resultant vector
A resultant force is a single force that has the same effect as the combined effect of all the forces to be added.

(ii) Torque
The rotational effect of a force is measured by a quantity, known as torque.

(iii) Centre of mass

Centre of mass of a system is such a point where an applied force causes the system to move without rotation.

(iv) Centre of gravity

a point where the whole weight of the body appears to act vertically downward is called the centre of gravity of a body.

4.3 Differentiate the following.

(i) Like and unlike parallel forces

Like Parallel Forces	Unlike Parallel Forces
Like parallel forces are the forces that are paralle to each other and have the same direction.	Unlike parallel forces are the forces that are parallel but have direction opposite to each other.

(ii) Torque and Couple

Torque	Couple
"The rotational effect of a force is measured by a quantity, known as torque".	A couple is formed by two unlike parallel forces of the same magnitude but not along the same line.

(iii) Stable and Neutral Equilibrium

Stable Equilibrium	Neutral Equilibrium
"A body is said to in stable equilibrium if after a slight tilt it returns to its previous position".	"If a body remains in its new position when disturbed from its previous position, it is said to be in a state of neutral equilibrium".

4.4 How head to tail rule helps to find the resultant of forces?

Ans: Draw the representative lines of all the force to be added in such a way that head of first force coincides with the tail of second force, head of second force coincides with the tail of third force and so on. The line obtained by joining the tail of first force with the head of last force represent resultant force.

4.5 How can a force be resolved into its rectangular components?

Ans: See Q. no.2 Long Question

4.6 When a body is said to be in equilibrium?

Ans: A body is said to be in equilibrium if no net force acts on it. A body in equilibrium remains at rest or moves with uniform velocity and has no linear acceleration as well as no rotational acceleration.

4.7 Explain the first condition for equilibrium.

Ans: See Q. no.8 Long Question

4.8 Whey there is need of second condition for equilibrium if a body satisfies first condition for equilibrium.

Ans: When two equal and opposite forces act on a body along the same line, it will be in equilibrium and no linear acceleration is produced in it. But when two equal and opposite forces act on a body not along the same line, the body is not in equilibrium because rotational acceleration is produced in the body although first condition is still satisfied. Hence in this case for the body to be in equilibrium second condition is needed.

4.9 What is second condition of equilibrium?

Ans: A body satisfies second condition of equilibrium when the resultant torque acting on it is zero.

4.10 Give an example of a moving body which is in equilibrium.

Ans: A paratrooper coming down with terminal velocity is in equilibrium. This type of equilibrium is known as dynamic equilibrium.

4.11 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.

4.12 When a body cannot be in equilibrium due to a single force on it? (LHR 2015)

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.

4.13 Why the height of vehicles is kept as low as possible?

Ans: We know that smaller the height of centre of gravity of a body, greater will be its stability. The height of vehicles is kept low to lower their centre of gravity and as a result their stability increases.

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

Ans: See Q. no.9 Long Question

Last Updated: October 2020

Report any mistake at freeilm786@gmail.com