IMPORTANT JEE-NEET FORMULAS

Alternating Current

Root Mean Square

The root mean square is given as:

$$f_{rms} = \sqrt{\frac{\int_{t_1}^{t_2} f(t)^2\, dt}{t_2 - t_1}}$$

Impedance

The impedance of a given circuit is determined by:

$$Z = \frac{V_m}{I_m} = \frac{V_{rms}}{I_{rms}}$$

Resistance

Resistivity:

$$\rho(T) = \rho(T_0)[1 + \alpha(T - T_0)]$$

Where $\rho(T)$ and $\rho(T_0)$ denotes the resistivity at temperature T and T_0 respectively and α is constant for a given material.

Magnetic Flux:

In General magnetic flux is determined by the total magnetic field lines which passes through a particular given area. Its SI unit is Weber.

Given as:

$$\phi = \vec{B}.d$$

$$=> \phi = \vec{B}\, ds \cos\theta$$

Where, θ is the angle between B and dS.

Lorentz Force

This force is basically defined as the sum of magnetic and electric force on a point charge due to the electromagnetic fields.

It is given as:

$$\vec{F} = q[\vec{E} + (\vec{V} \times \vec{B})]$$

Where,

E=Electric field

B= Magnetic field

q= Charge

v= Velocity of the particle

Equations of Motion

There are basically three types of equation of motion which are given as:

$(1)\ v = u - gt$

$(2)\ y = ut - \frac{1}{2}at^2$

$(3)\ 2gy = v^2 - u^2$

Projectile Motion Equation's:

In general the projectile is basically refers to an object that is in a particular flight when we throw that particular object. There are three equations of projectile motion that are given as:

For Horizontal Range (R)

$R = \frac{u^2 Sin2\theta}{g}$

Time of Flight (T)

$T = \frac{2USin\theta}{g}$

Maximum Height of projectile (H)

$H = \frac{(u\ Sin\theta)^2}{g}$

Maximum Horizontal range $(\boldsymbol{\theta_0 = 45^0})$

$R_m = \frac{u^2}{g}$

Components of Velocity at time t

$U_X = uCos\theta$

$U_Y = uSin\theta - gt$

Position at time t

$X = (uCos\theta)t$

$Y = (uSin\theta)t - \frac{1}{2}gt^2$

Newton's Law of Motion

In General newton has given three laws of motion.

Newton's First Law of Motion

"A body at rest or uniform motion will continue to be at rest or uniform motion until and unless a net external force acts on it".

Newton's Second Law of Motion

"The acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force, and inversely proportional to the object's mass".

$$F_X = \frac{dP_X}{dt} = ma_X$$

$$F_Y = \frac{dP_Y}{dt} = ma_Y$$

$$F_Z = \frac{dP_Z}{dt} = ma_Z$$

Newton's Third Law of Motion

"There is an equal and opposite reaction for every action".

$$\vec{F}_{AB} = -\vec{F}_{BA}$$

Newton's Law for a System

Newton's Law for a system is given as:

$$\vec{F}_{ext} = m_1\vec{a}_1 + m_2\vec{a}_2 + m_3\vec{a}_3 + m_4\vec{a}_4 + \cdots$$

Here,

$\vec{F}_{ext}$ = The total external force on the system.

m_1, m_2, m_3, m_4 are the masses of the object of the systems.

$\vec{a}_1, \vec{a}_2, \vec{a}_3, \vec{a}_4$ Are the acceleration of the objects respectively.

CIRCULAR MOTION

Average angular velocity:

$$\omega_{av} = \frac{\theta_2 - \theta_1}{t_2 - t_1}$$

$$\omega_{av} = \frac{\Delta\theta}{\Delta t}$$

Instantaneous angular velocity is given as:

$$\omega = \frac{d\theta}{dt}$$

Average angular acceleration is given as

$$\alpha_{av} = \frac{\omega_2 - \omega_1}{t_2 - t_1}$$

$$\alpha_{av} = \frac{\Delta\omega}{\Delta t}$$

Instantaneous angular acceleration is given as

$$\alpha = \frac{d\omega}{dt}$$

$$\alpha = \omega\frac{d\omega}{d\theta}$$

Centripetal acceleration is given as

$a_r = \frac{v^2}{r}$

$a_r = \omega^2 r$

Angular acceleration of a non-uniform circular motion is given as:

$=> \alpha = \frac{d\vec{\omega}}{dt}$

Banking formulas

Banking of road without friction is given as

$\tan\theta = \frac{v^2}{rg}$

Bending of cyclist is given as:

$=> \tan\theta = \frac{v^3}{rg}$

Banking of road with friction is given as:

$\frac{v^2}{rg} = \frac{\mu + tan\theta}{1 - \mu tan\theta}$

Centrifugal force is given as

$f = m\omega^2 r$

This force is acting outwards. This force is also known as pseudo force.

RIGID BODY DYNAMICS

Rigid body formula is given as:

$V_A \cos\theta_1 = V_B \cos\theta_2$

Moment of Inertia

It is defined as the capability of a system or object to resist the changed produced in the rotational motion of the body.

Moment of Inertia of:

A single Particle is given as:

$I = mr^2$

Where, m is the mass of the particle and

r is the perpendicular distance.

For a system of particles it is given as:

$I = \sum_{i=1}^{m} m_i r_i^2$

For a larger object it is given as:

$I = \int dI_{element}$

Where, dI is moment of inertia of a small element.

Perpendicular Axis Theorem

The moment of inertia of a body about any of its axes which are perpendicular to the plane is equal to the sum of the moment of inertia about any two perpendicular axes in the plane of the body which intersect the first axis in the plane.

That is:

$I_Z = I_X + I_Y$

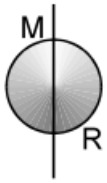
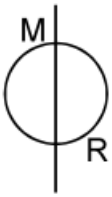
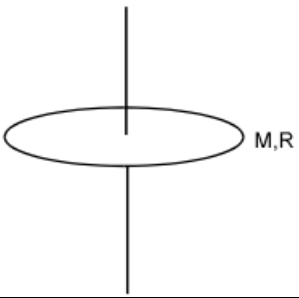
Parallel Axis Theorem

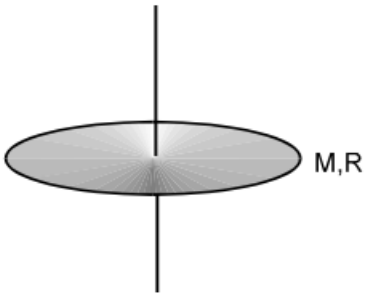
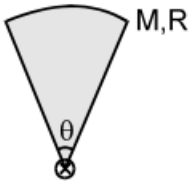
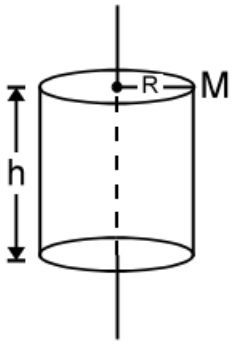
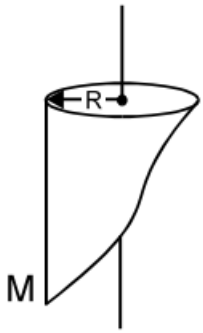
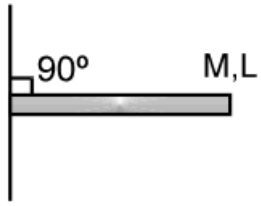
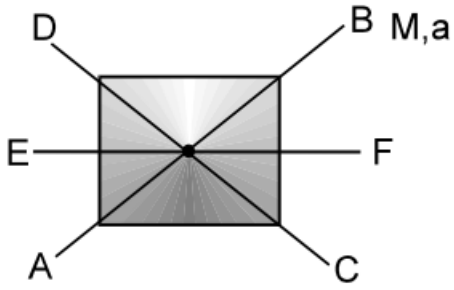
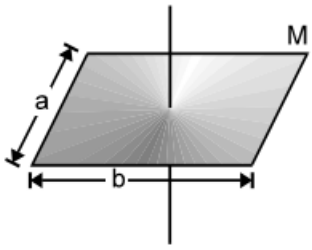
The moment of inertia of a body about an axis parallel to the body passing through its center is equal to the sum of the moment of inertia of the body about the axis passing through the center and the product of the mass of the body times the square of the distance of between the two axes.

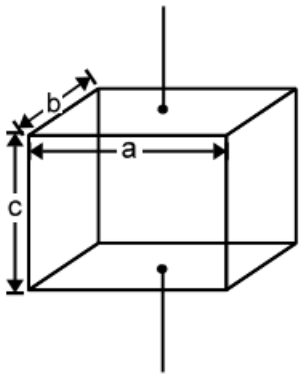
That is:

$I_{AB} = I_{cm} + Md^2$

List of some useful moment of inertia formulas:

Object	Moment of Inertia
Solid Sphere 	$\frac{2}{3}MR^2$
Hollow Sphere 	$\frac{2}{3}MR^2$
Ring 	MR^2
Disc	$\frac{MR^2}{2}$

 	
Hollow Cylinder  	MR^2
Solid Cylinder 	$\frac{ML^3}{3}$
Square Plate 	$I_{AB} = I_{CD} = I_{EF} = \frac{Ma^2}{12}$
Rectangular Plate 	$I = \frac{M(a^2 + b^2)}{12}$
Cuboid	$\frac{M(a^2 + b^2)}{12}$

Torque

Torque is generally know a turning effect of the force. It Is given as:

$\vec{\tau} = \vec{r} \times \vec{F}$