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Chapter : SYSTEM OF PARTICLES AND ROTATIONAL MOTION

Assignment 3

Class 11

DPP
DAILY PRACTICE PROBLEMS

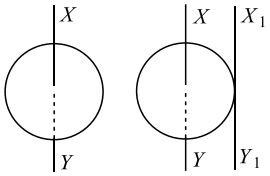
CLASS : XITH **SUBJECT : PHYSICS**
DATE : **DPP NO. : 3**

Topic :- SYSTEM OF PARTICLES AND ROTATIONAL MOTION

1. A fly wheel of moment of inertia $3 \times 10^2\ kg\ m^2$ is rotating with uniform angular speed of 4.6 rad s^{-1}. If a torque of 6.9×10^2 N m retards the wheel, then the time in which the wheel comes to rest is

   a) 1.5 s b) 2 s c) 0.5 s d) 1 s

2. The moment of inertia of a circular disc of radius 2 m and mass 1 kg about an axis passing through the centre of mass but perpendicular to the plane of the disc is 2 $kg\ m^2$. Its moment of inertia about an axis parallel to this axis but passing through the edge of the disc is ..... (see the given figure)



   a) 8 kgm^2 b) 4 kgm^2 c) 10 kgm^2 d) 6 kgm^2

3. Four particles each of mass m are lying symmetrically on the rim of a disc of mass M and radius R. Moment of inertia of this system about an axis passing through one of the particles and perpendicular to plane of disc is

   a) $16\ mR^2$ b) $(3M + 16m)\frac{R^2}{2}$ c) $(3M + 12m)\frac{R^2}{2}$ d) Zero

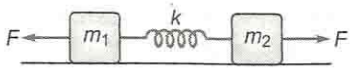
4. A solid sphere of mass 500 g and radius 10 cm rolls without slipping with the velocity 20 cm/s. The total kinetic energy of the sphere will be

   a) 0.014 J b) 0.028 J c) 280 J d) 140 J

5. A thin uniform square lamina of side a is placed in the xy-plane with its sides parallel to x and y-axis and with its centre coinciding with origin. Its moment of inertia about an axis passing through a point on the y-axis at a distance $y = 2a$ and parallel to x-axis is equal to its moment of inertia about an axis passing through a point on the x-axis at a distance $x = d$ and perpendicular to xy-plane. Then value of d is

   a) $\frac{7}{3}a$ b) $\sqrt{\frac{47}{12}}a$ c) $\frac{9}{5}a$ d) $\sqrt{\frac{51}{12}}a$

6. In the given figure, two bodies of mass m_1 and m_2 are connected by massless spring of force constant k and are placed on a smooth surface (shown in figure), then



a) The acceleration of centre of mass must be zero at every instant
b) The acceleration of centre of mass may be zero at every instant
c) The system always remains in rest
d) None of the above

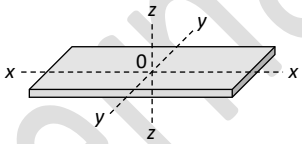
7. A horizontal platform is rotating with uniform angular velocity around the vertical axis passing through its centre. At some instant of time a viscous fluid of mass 'm' is dropped at the centre and is allowed to spread out and finally fall. The angular velocity during this period

a) Decreases continuously
b) Decreases initially and increases again
c) Remains unaltered
d) Increases continuously

8. Out of the given bodies (of same mass) for which the moment of inertia will be maximum about the axis passing through its centre of gravity and perpendicular to its plane

a) Disc of radius a b) Ring of radius a
c) Square lamina of side $2a$ d) Four rods of length $2a$ making a square

9. The rectangular block shown in the figure is rotated in turn about $x-x, y-y$ and $z-z$ axes passing through its centre of mass O. Its moment of inertia is



a) Same about all the three axes b) Maximum about $z-z$ axis
c) Equal about $x-x$ and $y-y$ axes d) Maximum about $y-y$ axis

10. A uniform rod of length L and mass 1.8 kg is made to rest on two measuring scale at its two ends. A uniform block of mass 2.7 kg is placed on the rod at a distance $L/4$ from the left end. The force experienced by the measuring scale on the right end is

a) 18 N b) 27 N c) 29 N d) 45 N

11. The moment of inertia of a flywheel having kinetic energy 360 J and angular speed of 20 rad/s is

a) $18kgm^2$ b) $1.8kgm^2$ c) $2.5kgm^2$ d) $9kgm^2$

12. The angular momentum of a wheel changes from $2L$ to $5L$ in 3 $seconds$. What is the magnitude of the torque acting on it

a) L b) $L/2$ c) $L/3$ d) $L/5$

13. When the angle of inclination of an inclined plane is θ, an object slides down with uniform velocity. If the same object is pushed up with a initial velocity u on the same inclined plane; it goes up the plane and stops at a certain distance on the plane. Thereafter the body

a) Slides down the inclined plane and reaches the ground with velocity u.
b) Slides down the inclined plane and reaches the ground with velocity less than u.
c) Slides down the inclined plane and reaches the ground with velocity greater than u.
d) Stays at rest on the inclined plane and will not slide down.

14. Moment of inertia of ring about its diameter is I. Then, moment of inertia about an axis passing through centre perpendicular to its plane is

a) $2I$ b) $\frac{I}{2}$ c) $\frac{3}{2}I$ d) I

15. Three identical metal balls each of radius r are placed touching each other on a horizontal surface such that an equilateral triangle is formed, when centres of three balls are joined. The centre of the mass of system is located at

a) Horizontal surface
b) Centre of one of the balls
c) Line jointing centres of any two balls
d) Point of intersection of the medians

16. Two bodies have their moments of inertia I and $2I$ respectively about their axis of rotation. If their kinetic energies of rotation are equal, their angular momentum will be in the ratio

a) $1:2$ b) $\sqrt{2}:1$ c) $2:1$ d) $1:\sqrt{2}$

17. A wheel rotates with a constant angular velocity of 300 rpm. The angle through which the wheel rotates in 1 s is

a) π rad b) 5π rad c) 10π rad d) 20π rad

18. Identify the increasing order of the angular velocities of the following :

1.Earth rotating about its own axis
2.Hour's hand of a clock
3.Second's hand of a clock
4. Flywheel of radius 2 m making 300 rpm

a) 1, 2, 3, 4 b) 2, 3, 4, 1 c) 3, 4, 1, 2 d) 4, 1, 2, 3

19. A ball strikes a horizontal floor at an angle $\theta = 45°$. The coefficient of restitution between the ball and the floor is $e = 1/2$. The fraction of its kinetic energy lost in collision in

a) $5/8$ b) $3/8$ c) $3/4$ d) $1/4$

20. A force of 200 N acts tangentially on the rim of a wheel 25 cm in radius. Find the torque

a) 50 Nm b) 150 Nm c) 75 Nm d) 39 Nm