# DPP
DAILY PRACTICE PROBLEMS

**CLASS : XITH** **SUBJECT : PHYSICS**
**DATE :** **DPP NO. : 9**

## Topic :- SYSTEM OF PARTICLES AND ROTATIONAL MOTION

1. The total kinetic energy of a body of mass 10 $kg$ and radius 0.5 $m$ moving with a velocity of 2 $m/s$ without slipping is 32.8 $joule$. The radius of gyration of the body is
   a) 0.25 $m$ b) 0.2 $m$ c) 0.5 $m$ d) 0.4 $m$

2. A body having moment of inertia about its axis of rotation equal to 3 $kg$ - $m^2$ is rotating with angular velocity equal to 3 $rad/s$. Kinetic energy of this rotating body is the same as that of body of mass 27 $kg$ moving with a speed of
   a) 1.0 $m/s$ b) 0.5 $m/s$ c) 1.5 $m/s$ d) 2.0 $m/s$

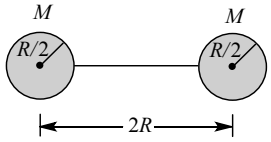
3. A bullet of mass 5g moving with a velocity 10 $ms^{-1}$ strikes a stationary body of mass 955g and enters it. The percentage loss of kinetic energy of the bullet is
   a) 85 b) 0.05 c) 99.5 d) None of the above

4. A diatomic molecule is formed by two atoms which may be treated as mass points $m_1$ and $m_2$ , joined by a massless rod of length $r$. Then the moment of inertia of the molecule about an axis passing through the centre of mass and perpendicular to rod is
   a) zero b) $(m_1 + m_2)r^2$ c) $\left(\frac{m_1+m_2}{m_1m_2}\right)r^2$ d) $\left(\frac{m_1m_2}{m_1+m_2}\right)r^2$

5. A disc starting from rest acquires in 10 sec an angular velocity of 240 revolutions/minute. Its angular acceleration (assuming constant) is
   a) 1.52 $rad/s$ b) 2.51 $rad/s$ c) 3.11 $rad/s$ d) 3.76 $rad/s$

6. A flywheel gains a speed of 540 $r.p.m.$ in 6 $sec$. Its angular acceleration will be
   a) $3\pi\ rad/sec^2$ b) $9\pi\ rad/sec^2$ c) $18\pi\ rad/sec^2$ d) $54\pi\ rad/sec^2$

7. Two spheres each of mass $M$ and radius $R/2$ are connected with a massless rod of length $2R$ as shown in the figure. What will $b$ be the moment of inertia of the system about an axis passing through the centre of one of the sphere and perpendicular to the rod




   a) $\frac{21}{5}MR^2$ b) $\frac{2}{5}MR^2$ c) $\frac{5}{2}MR^2$ d) $\frac{5}{21}MR^2$

8. Two rings have their moments of inertia in the ratio 2:1 and their diameters are in the ratio 2:1. The ratio of their masses will be

a) 2 :1 b) 1 :2 c) 1 :4 d) 1 :1

9. The moment of inertia of a straight thin rod of mass $M$ and length $l$ about an axis perpendicular to its length and passing through its one end, is

a) $Ml^2/12$ b) $Ml^2/3$ c) $Ml^2/2$ d) $Ml^2$

10. The position of a particle is given by: $\vec{r} = (\hat{i} + 2\hat{j} - \hat{k})$ and momentum $\vec{P} = (3\hat{i} + 4\hat{j} - 2\hat{k})$. The angular momentum is perpendicular to

a) $X$- axis b) $Y$- axis
c) $Z$- axis d) Line at equal angles to all the three axes

11. A sphere of mass $m$ and radius $r$ rolls on a horizontal plane without slipping with the speed $u$. Now if it rolls up vertically, the maximum height it would attain will be

a) $3u^2/4g$ b) $5u^2/2g$ c) $7u^2/10g$ d) $u^2/2g$

12. A 10 $kg$ body hangs at rest from a rope wrapped around a cylinder 0.2 $m$ in diameter. The torque applied about the horizontal axis of the cylinder is

a) 98 $N$-$m$ b) 19.6 $N$-$m$ c) 196 $N$-$m$ d) 9.8 $N$-$m$

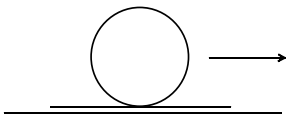
13. The moment of inertia of a circular disc about one of its diameter is $I$. What will be its moment of inertia about a tangent parallel to the diameter?

a) $4I$ b) $2I$ c) $\frac{3}{2}I$ d) $3I$

14. A thin metal disc of radius of 0.25 m and mass 2 kg starts from rest and rolls down on an inclined plane. If its rotational kinetic energy is 4 J at the foot of inclined plane, then the linear velocity at the same point, is in $ms^{-1}$.

a) 2 b) $2\sqrt{2}$ c) $2\sqrt{3}$ d) $3\sqrt{2}$

15. A ball rests upon a flat piece of paper on a table top. The paper is pulled horizontally but quickly towards right as shown. Relative to its initial position with respect to the table, the ball



(1) Remains stationary if there is no friction between the paper and the ball
(2) Moves to the left and starts rolling backwards, *i.e.*, to the left it there is a friction between the paper and the ball
(3) Moves forward, *i.e.*, in the direction in 'which the paper is pulled.
Here, the correct statement/s is/are

a) Both (1) and (2) b) Only (3) c) Only (1) d) Only (2)

16. A rectangular block has a square base measuring $a \times a$, and its height is h. Its moves on a horizontal surface in a direction perpendicular to one of its edges. The coefficient of friction is μ. It will topple if

a) $\mu > h/a$ b) $\mu > a/h$ c) $\mu > \frac{2a}{h}$ d) $\mu > \frac{a}{2h}$

17. Centre of mass is a point

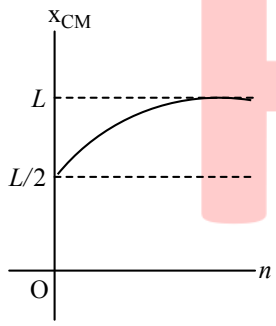
a) Which is geometric centre of a body
b) From which distance of particles are same
c) Where the whole mass of the body is supposed to concentrated
d) Which is the origin of reference frame

18. When a ceiling fan is switched on, it makes 10 revolutions in the first 3 seconds. Assuming a uniform angular acceleration, how many rotation it will make in the next 3 seconds

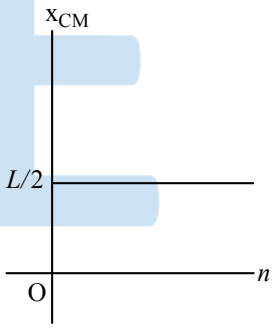
a) 10 b) 20 c) 30 d) 40

19. A thin rod of length $L$ is lying along the $x$-axis with its ends at $x = 0$ and $x = L$. Its linear density (mass\length) varies with $x$ as $k\left(\frac{x}{L}\right)^n$, when $n$ can be zero or any positive number. If the position $x_{CM}$ of the centre of mass of the rod is plotted against $n$, which of the following graphs best approximates the dependence of $x_{CM}$ on $n$?

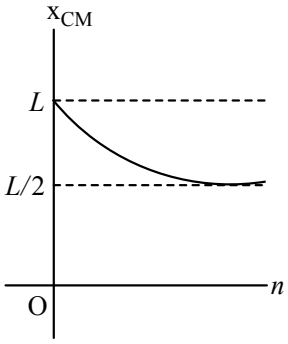
a)



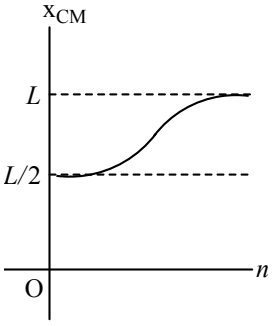

b)




c)




d)




20. A 2 $kg$ body and a 3 $kg$ body are moving along the $x$-axis. At a particular instant the 2 $kg$ body has a velocity of 3 $ms^{-1}$ and the 3 $kg$ body has the velocity of 2 $ms^{-1}$. The velocity of the centre of mass at that instant is

a) 5 $ms^{-1}$ b) 1 $ms^{-1}$ c) 0 d) None of these