PRERNA EDUCATION
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Chapter : SYSTEM OF PARTICLES AND ROTATIONAL MOTION

Assignment 1

Class 11

DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH **SUBJECT : PHYSICS**
DATE : **DPP NO. : 1**

Topic :- SYSTEM OF PARTICLES AND ROTATIONAL MOTION

1. Three identical balls A, B and C are lying on a horizontal frictionless table as shown in figure. If ball A is imparted a velocity v towards B and C and the collisions are perfectly elastic, then finally
   a) Ball A comes to rest and balls B and C roll out with sped $v/2$ each
   b) Ball A and B are a rest and ball C roll out with speed v
   c) All the three balls roll out with speed $v/3$ each
   d) All the three balls come to rest

2. Moment of inertia of a solid cylinder of length L and diameter D about an axis passing through its centre of gravity and perpendicular to its geometric axis is
   a) $M\left(\frac{D^2}{4}+\frac{L^2}{12}\right)$ b) $M\left(\frac{L^2}{16}+\frac{D^2}{8}\right)$ c) $M\left(\frac{D^2}{4}+\frac{L^2}{6}\right)$ d) $M\left(\frac{L^2}{12}+\frac{D^2}{16}\right)$

3. The M.I. of a body about the given axis is $1.2\ kg \times m^2$ initially the body is at rest. In order to produce a rotational kinetic energy of $1500\ J$, an angular acceleration of $25\ rad/sec^2$ must be applied about that axis for duration of
   a) $4\ sec$ b) $2\ sec$ c) $8\ sec$ d) $10\ sec$

4. A circular disc is to be made by using iron and aluminium, so that it acquires maximum moment of inertia about its geometrical axis. It is possible with
   a) Iron and aluminium layers in alternate order
   b) Aluminium at interior and iron surrounding it
   c) Iron at interior and aluminium surrounding it
   d) Either (a) or (c)

5. The distance between the centres of carbon and oxygen atoms in the carbon monoxide molecule is 1.130 Å. Locate the centre of mass of the molecule relative to the carbon atom.
   a) 5.428 Å b) 1.130 Å c) 0.6457 Å d) 0.3260 Å

6. Two particles of masses m_1 and m_2 initially at rest start moving towards each other under their mutual force of attraction. The speed of the centre of mass at any time t, when they are at a distance r apart, is

a) Zero b) $\left(G\frac{m_1m_2}{r^2}.\frac{1}{m_1}\right)t$ c) $\left(G\frac{m_1m_2}{r^2}.\frac{1}{m_2}\right)t$ d) $\left(G\frac{m_1m_2}{r^2}.\frac{1}{m_1+m_2}\right)t$

7. A sphere of mass 0.5 kg and diameter $1m$ rolls without sliding with a constant velocity of 5 m/s, calculate what is the ratio of the rotational $K.E.$ to the total kinetic energy of the sphere

a) $\frac{7}{10}$ b) $\frac{5}{7}$ c) $\frac{2}{7}$ d) $\frac{1}{2}$

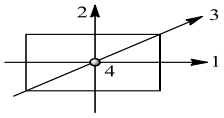
8. The moment of inertia of a uniform horizontal cylinder of mass M about an axis passing through its edge and perpendicular to the axis of the cylinder when its length is 6 times its radius R is

a) $\frac{39}{4}MR^2$ b) $\frac{39}{4}MR$ c) $\frac{49}{4}MR$ d) $\frac{49}{4}MR^2$

9. A $1m$ long rod has a mass of 0.12 kg. What is the moment of inertia about an axis passing through the centre and perpendicular to the length of rod

a) $0.01kg\text{-}m^2$ b) $0.001kg\text{-}m^2$ c) $1kg\text{-}m^2$ d) $10kg\text{-}m^2$

10. About which axis in the following figure the moment of inertia of the rectangular lamina is maximum?



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

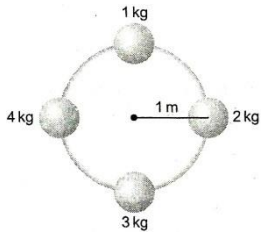
11. A ring starts to roll down the inclined plane of height h without slipping. The velocity with which it reaches the ground is

a) $\sqrt{\frac{10gh}{7}}$ b) $\sqrt{\frac{4gh}{7}}$ c) $\sqrt{\frac{4gh}{3}}$ d) $\sqrt{gh}$

12. The angular momentum of particle

a) Is perpendicular to the plane of the surface in which it moves
b) Along the plane of motion
c) Inclined at any angle with the plane
d) Has no particular direction

13. Four balls each of radius 10 cm and mass 1 kg, 2kg, 3 kg and 4 kg are attached to the periphery of massless plate of radius 1 m. What is moment of inertia of the system about the centre of plate?



a) 12.04 kg-m^2 b) 10.04 kg-m^2 c) 11.50 kg-m^2 d) 5.04 kg-m^2

14. A constant torque of 1000 N-m turns a wheel of moment of inertia 200kg-m^2 about an axis through its centre. Its angular velocity after 3 sec is

a) 1 rad/sec b) 5 rad/sec c) 10 rad/sec d) 15 rad/sec

15. A circular disc of radius R is removed from a bigger circular disc of radius $2R$, such that the circumference of the discs coincide. The center of mass of the new disc is $\frac{\alpha}{R}$ from the center of the bigger disc the value of α is

a) $\frac{1}{3}$ b) $\frac{1}{2}$ c) $\frac{1}{6}$ d) $\frac{1}{4}$

16. If solid sphere and solid cylinder of same radius and density rotate about their own axis, the moment of inertia will be greater for $(L = R)$

a) Solid sphere b) Solid cylinder c) Both d) Equal both

17. The moment of inertia of a thin rod of mass M and length L, about an axis perpendicular to the rod at a distance $\frac{L}{4}$ from one end is

a) $\frac{ML^2}{6}$ b) $\frac{ML^2}{12}$ c) $\frac{7ML^2}{24}$ d) $\frac{7ML^2}{48}$

18. The moments of inertia of two freely rotating bodies A and B are I_A and I_B respectively. $I_A > I_B$ and their angular momenta are equal. If K_A and K_B are their kinetic energies, then

a) $K_A = K_B$ b) $K_A > K_B$ c) $K_A < K_B$ d) $K_A = 2K_B$

19. The radius of gyration of a thin uniform circular disc (of radius R) about an axis passing through its centre and lying in its plane is

a) R b) $\frac{R}{\sqrt{2}}$ c) $\frac{R}{4}$ d) $\frac{R}{2}$

20. The position of a particle is given by r=$\hat{i}$ + 2$\hat{j}$ - $\hat{k}$ and its linear momentum is given by p = 3 $\hat{i}$ + 4 $\hat{j}$ - 2 +$\hat{k}$ then its angular momentum, about the origin is perpendicular to

a) yz-plane b) z-axis c) y-axis d) x-axis