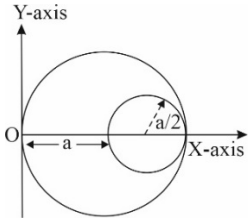
PHYSICS

41. Given that force $(5\hat{i}+7\hat{j}-3\hat{k})$N acts on a particle at position $(\hat{i}+\hat{j}-\hat{k})$m. Find torque of this force on the particle about origin.
(1) $4\hat{i}-2\hat{j}+2\hat{k}$ (2) $2\hat{i}-3\hat{j}+4\hat{k}$
(3) $5\hat{i}-2\hat{j}+3\hat{k}$ (4) $6\hat{i}-4\hat{j}+4\hat{k}$

42. Two homogeneous spheres A and B of masses m and 2m having radii 2a and a respectively are placed in touch. The distance of centre of mass from first sphere is
(1) a (2) 2a
(3) 3a (4) none of these

43. **Assertion**: For a system of particles under central force field, the total angular momentum is conserved.
Reason: The torque acting on such a system is zero.
(1) If both assertion and reason is true and reason is the correct explanation of assertion.
(2) If both assertion and reason is true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason is false.

44. A circular hole of radius $\left(\frac{a}{2}\right)$ is cut out of a circular disc of radius 'a' as shown in figure. The CM of the remaining circular portion with respect to point 'O' will be

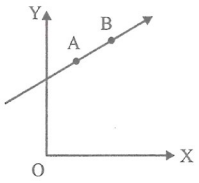


(1) $\frac{1}{6}a$ (2) $\frac{10}{11}a$
(3) $\frac{5}{6}a$ (4) $\frac{2}{3}a$

45. Consider a uniform square plate of side 'a' and mass 'M'. The moment of inertia of this plate about an axis perpendicular to its plane and passing through one of its corners is
(1) $\frac{5}{6}Ma^2$ (2) $\frac{1}{12}Ma^2$
(3) $\frac{7}{12}Ma^2$ (4) $\frac{2}{3}Ma^2$

46. The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is
(1) $\sqrt{2}:1$ (2) 4 : 1
(3) $1:\sqrt{2}$ (4) 2 : 1

47. A particle of mass m moves in the plane with a velocity v along the straight line AB. If the angular momentum of the particle with respect to origin O is L_A when it is at A and L_B when it is at B, then



(1) $L_A = L_B$
(2) the relationship between L_A and L_B depends upon the slope of the line AB
(3) $L_A < L_B$
(4) $L_A > L_B$

48. The moment of inertia of a disc of mass M and radius R about an axis, which is tangential to the circumference of the disc and parallel to its diameter, is
(1) $\frac{3}{2}MR^2$ (2) $\frac{2}{3}MR^2$
(3) $\frac{5}{4}MR^2$ (4) $\frac{4}{5}MR^2$

49. A light rod of length *l* has two masses m_1 and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is
(1) $\frac{m_1m_2}{m_1+m_2}l^2$ (2) $\frac{m_1+m_2}{m_1m_2}l^2$
(3) $(m_1 + m_2)l^2$ (4) $\sqrt{m_1m_2}l^2$

50. Moment of inertia of a hollow cylinder of mass M and radius r about its own axis is
(1) $\frac{2}{3}Mr^2$ (2) $\frac{2}{5}Mr^2$
(3) $\frac{1}{3}Mr^2$ (4) Mr^2