31. A square plate is kept in YZ-plane. Then according to perpendicular axis theorem.
(1) $I_Z = I_X + I_Y$ (2) $I_Y = I_X + I_Z$
(3) $I_X = I_Y + I_Z$ (4) All of these

32. A cylinder is completely filled with water. If $1/4^{th}$ of the volume of water leaks out, its centre of mass
(1) moves up
(2) moves down
(3) does not change
(4) moves towards vertical surface

33. A uniform meter stick is placed vertically on a horizontal frictionless surface and released. As the stick is in motion, the centre of mass moves
(1) vertically up
(2) vertically down
(3) in a parabolic path
(4) horizontally

34. Choose the correct statement
(1) Centre of mass of two particles will be nearer to lighter particle
(2) Centre of mass of the rigid body depends on reference frame used
(3) Centre of mass of the system of particles depends on the masses of the particles
(4) Centre of mass must lie within the body

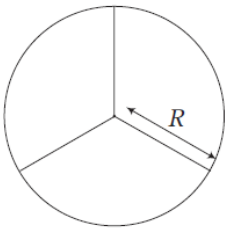
35. Choose the wrong statement
(1) In the process of explosion some changes may occur in momentum of individual fragments due to internal forces but the motion of centre of mass is unaltered
(2) Motion of centre of mass depends upon the internal force
(3) The location of centre of mass depends up on the reference frame used to locate it
(4) The position of centre of mass depends upon a shape of a body and the distribution of mass

36. In an arrangement four particles, each of mass 2 gram are situated at the coordinate points (3, 2, 0), (1, –1, 0), (0, 0, 0) and (–1, 1, 0). The moment of inertia of this arrangement about the Z-axis will be
(1) 8 units (2) 16 units
(3) 43 units (4) 34 units

37. Three thin uniform rods each of mass M and length L and placed along the three axes of a Cartesian coordinate system with one end of each rod at the origin. The moment of inertia of the system about z-axis is
(1) $\frac{ML^2}{3}$ (2) $\frac{ML^2}{6}$
(3) $\frac{2ML^2}{3}$ (4) ML^2

38. The theorem of perpendicular axes is not applicable for determination of moment of inertia along the diameter, for which of the following body?
(1) Sphere (2) Disc
(3) Ring (4) Blade

39. A wheel comprises a ring of radius R and mass M and three spokes each of mass m. The moment of inertia of the wheel about its axis is



(1) $\left(M+\frac{m}{4}\right)R^2$ (2) $(M+m)R^2$
(3) $(M+3m)R^2$ (4) $\left(\frac{M+m}{2}\right)R^2$

40. One quarter sector is cut from a uniform circular disc of radius R. This sector has mass M. It is made to rotate about a line perpendicular to its plane and passing through the centre of the original disc. Its moment of inertia about the axis of rotation is
(1) $\frac{MR^2}{8}$ (2) $\frac{MR^2}{4}$
(3) $\frac{MR^2}{2}$ (4) MR^2