1. Moment of inertia of a uniform square plate of length $x = y = a$ and mass $M$ about $x$ and $y$ axes are
   (a) $I_{xx} = \frac{1}{12}Ma^2$ and $I_{yy} = \frac{1}{12}Ma^2$
   (b) $I_{xx} = \frac{1}{3}Ma^2$ and $I_{yy} = \frac{2}{3}Ma^2$
   (c) $I_{xx} = \frac{1}{3}Ma^2$ and $I_{yy} = \frac{2}{3}Ma^2$
   (d) $I_{xx} = \frac{2}{3}Ma^2$ and $I_{yy} = \frac{1}{3}Ma^2$

2. Moment of inertia of a uniform square plate of length $x = y = a$ and mass $M$ about $z$ axis is
   (a) $I_{zz} = \frac{1}{3}Ma^2$
   (b) $I_{zz} = \frac{2}{3}Ma^2$
   (c) $I_{zz} = Ma^2$
   (d) $I_{zz} = \frac{2}{3}Ma^2$

3. Product of inertia of a uniform square plate of length $x = y = a$ and mass $M$ are
   (a) $I_{xy} = I_{yx} = 0$, $I_{xz} = I_{zx} = 0$ and $I_{yz} = I_{zy} = 0$
   (b) $I_{xy} = I_{yx} = -\frac{1}{12}Ma^2$, $I_{xz} = I_{zx} = 0$ and $I_{yz} = I_{zy} = 0$
   (c) $I_{xy} = I_{yx} = 0$, $I_{xz} = I_{zx} = -\frac{1}{3}Ma^2$ and $I_{yz} = I_{zy} = -\frac{1}{3}Ma^2$
   (d) $I_{xy} = I_{yx} = 0$, $I_{xz} = I_{zx} = -\frac{1}{12}Ma^2$ and $I_{yz} = I_{zy} = 0$

4. Principal moment of inertia of a uniform square plate of length $x = y = a$ and mass $M$ are
   (a) $I_1 = 0$, $I_2 = 0$ and $I_3 = 0$
   (b) $I_1 = \frac{1}{12}Ma^2$, $I_2 = 0$ and $I_3 = \frac{7}{12}Ma^2$
   (c) $I_1 = \frac{1}{12}Ma^2$, $I_2 = \frac{7}{12}Ma^2$ and $I_3 = 0$
   (d) $I_1 = \frac{1}{12}Ma^2$, $I_2 = \frac{7}{12}Ma^2$ and $I_3 = \frac{2}{3}Ma^2$

5. Moment of inertia of a solid circular plate of radius $a$, height $h$ and mass $M$ about an axis on the surface of the cylinder and parallel to the axis of the cylinder
   (a) $Ma^2$
   (b) $\frac{2}{3}Ma^2$
   (c) $\frac{3}{2}Ma^2$
   (d) $\frac{1}{2}Ma^2$

6. Radius of gyration of a rectangular plate with sides $a$ and $b$ about an axis perpendicular to the plate and passing through a vertex is
   (a) $\frac{1}{2}Ma^2 + b^2$
   (b) $\sqrt{\frac{1}{3}(a^2 + b^2)}$
   (c) $\sqrt{\frac{1}{3}M(a^2 + b^2)}$
(d) \( \frac{1}{3}(a^2 + b^2) \)

7. Calculate the radius of gyration of a spherical shell of mass \( M \) and radius \( R \) with origin (fixed point) at its center
(a) \( \sqrt{\frac{3}{8}} R \)
(b) \( \sqrt{\frac{2}{3}} R \)
(c) \( \sqrt{\frac{3}{4}} R \)
(d) \( \sqrt{\frac{2}{5}} R \)

8. A solid cylinder of radius \( a \) and mass \( M \) rolls without slipping down an inclined plane of angle \( \theta \). The acceleration is
(a) \( g \sin \theta \)
(b) \( \frac{3}{4} g \sin \theta \)
(c) \( \frac{1}{3} \sin \theta \)
(d) \( \frac{2}{3} g \sin \theta \)

9. Equation for the ellipsoid of inertia corresponding to a square plate of length \( x = y = a \) is
(a) \( \rho_x^2 + \rho_y^2 + 2\rho_z^2 - \frac{3}{2} \rho_x \rho_y = \frac{3}{M a^2} \)
(b) \( \rho_x^2 + \rho_y^2 + 2\rho_z^2 + \frac{3}{2} \rho_x \rho_y = \frac{3}{M a^2} \)
(c) \( \rho_x^2 - \rho_y^2 - 2\rho_z^2 - \frac{3}{2} \rho_x \rho_y = \frac{3}{M a^2} \)
(d) \( \rho_x^2 + \rho_y^2 + 2\rho_z^2 + \frac{3}{2} \rho_x \rho_y = \frac{3}{M a^2} \)

10. If a rigid body with one point fixed rotates with angular velocity \( \mathbf{\Omega} \) and has angular momentum \( \mathbf{\Omega} \), then kinetic energy can be written as
(a) \( \frac{1}{2}(I_{xx} \omega_x^2 + I_{yy} \omega_y^2 + I_{zz} \omega_z^2) \)
(b) \( 2I_{xy} \omega_x \omega_y + 2I_{xz} \omega_x \omega_z + 2I_{yz} \omega_y \omega_z \)
(c) \( \frac{1}{2}(I_{xx} \omega_x^2 + I_{yy} \omega_y^2 + I_{zz} \omega_z^2 - 2I_{xy} \omega_x \omega_y - 2I_{xz} \omega_x \omega_z - 2I_{yz} \omega_y \omega_z) \)
(d) \( \frac{1}{2}(I_{xx} \omega_x^2 + I_{yy} \omega_y^2 + I_{zz} \omega_z^2 + 2I_{xy} \omega_x \omega_y + 2I_{xz} \omega_x \omega_z + 2I_{yz} \omega_y \omega_z) \)

End