ROLLING MOTION

1. A body is rolling without slipping on a horizontal surface and its rotational kinetic energy is equal to the translational kinetic energy. The body is:
   (a) Disc (b) Sphere (c) Cylinder **(d)** Ring
2. A thin uniform circular ring is rolling down an inclined plane of inclination 30° without slipping. Its linear acceleration along the inclined plane will be:
   (a) $g/2$ **(b)** $g/4$ (c) $g/3$ (d) $3g/4$
3. A disc is rolling. The velocity of center of mass is v_{cm}. Which of the following statements is correct:
   (a) Velocity of highest point is 2 v_{cm} and point of contact is zero (b) Velocity of highest point is v_{cm} and point of contact is v_{cm} (c) Velocity of highest point is 2 v_{cm} and point of contact is v_{cm} (d) Velocity of highest point is 2 v_{cm} and point of contact is 2 v_{cm}
4. The speed center of mass of a solid cylinder after rolling down an inclined plane of vertical height h, from rest is:
   (a) $\sqrt{\frac{10}{7}gh}$ (b) $\sqrt{\frac{6}{5}gh}$ (c) $\sqrt{gh}$ **(d)** $\sqrt{\frac{4}{3}gh}$
5. A body of mass m slides down an incline and reaches the bottom with a velocity v. If the same mass were in the form of a ring which rolls down this incline, the velocity of the ring at the bottom will be:
   (a) v (b) $\sqrt{2}v$ **(c)** $v/\sqrt{2}$ (d) $2v$
6. A sphere of mass M rolls without slipping on an inclined plane of angle θ. What should be the minimum coefficient of friction, so that the sphere rolls down without slipping:
   (a) $\frac{2}{5}tan\theta$ **(b)** $\frac{2}{7}tan\theta$ (c) $\frac{5}{7}tan\theta$ (d) $tan\theta$
7. A thick walled hollowed sphere has outer radius R. It rolls down inclined plane without slipping and speed at the bottom is v. If the inclined plane is frictionless and the sphere slides down without rolling, its speed at the bottom will be $5v/4$. What is the radius of gyration of the sphere:
   (a) $R/\sqrt{2}$ (b) $R/2$ **(c)** $3R/4$ (d) $\sqrt{3}R/4$
8. A ring of radius R slides down an inclined plane and reaches the bottom with speed v. If the radius of the ring is doubled keeping its M.I. constant, the speed at the bottom of the inclined plane will be:
   (a) $2v$ (b) $v/2$ (c) $v/\sqrt{2}$ **(d)** v
9. A body rolls without slipping. The radius of gyration of the body about an axis passing through its center of mass is k. If the radius of the body be R, then what is the ratio of rotational kinetic energy to total kinetic energy:
   (a) $k^2 + R^2$ (b) $\frac{k^2}{R^2}$ **(c)** $\frac{k^2}{k^2+R^2}$ (d) $\frac{R^2}{k^2+R^2}$
10. A circular disc of mass m and radius R is rotating about its axis with uniform speed v. What is its kinetic energy: (a) mv^2 (b) ½ mv^2 **(c)** ¼ mv^2 (d) 1/8 mv^2