A uniform circular ring of mass 400 g and radius 10 cm is rotated about one of its diameter at an angular speed of 20 rad/s. Find the kinetic energy of the ring and its angular momentum about the axis of rotation.

Solution :

The moment of inertia of the circular ring about its diameter is

$$I = \frac{1}{2}Mr^2 = \frac{1}{2}(0.400\ \text{kg})(0.10\ \text{m})^2 = 2 \times 10^{-3}\ \text{kg-m}^2.$$

The kinetic energy is

$$K = \frac{1}{2}I\omega^2 = \frac{1}{2}(2 \times 10^{-3}\ \text{kg - m}^2)(400\ \text{rad}^2/\text{s}^2) = 0.4\ \text{J}$$

and the angular momentum about the axis of rotation is

$$L = I\omega = (2 \times 10^{-3}\ \text{kg-m}^2)(20\ \text{rad/s})$$

$$= 0.04\ \text{kg-m}^2/\text{s} = 0.04\ \text{J-s}.$$