

## Worksheet for Class XI

### Module 1 of 3

- Q1. Define average angular velocity. Write its SI unit and dimensions.
- Q2. Write an expression for the instantaneous angular velocity.
- Q3. Define average angular acceleration. Write its SI unit and dimensions.
- Q4. Name a pseudoforce regarded as a reaction to the centripetal force.
- Q5. A wheel rotates with a constant angular acceleration of  $3.6 \text{ rad s}^{-2}$ . If the angular velocity of the wheel is  $4 \text{ rad s}^{-1}$  at time  $t = 0 \text{ s}$ , what angle does the wheel rotate in  $1 \text{ s}$ ? What will be its angular velocity at  $t = 1 \text{ s}$ ?
- Q6. A constant torque is acting on a wheel. If the wheel starts to rotate from rest and makes  $n$  revolutions in  $t$  seconds, show that the angular acceleration required is given as

$$\alpha = \frac{4\pi n}{t^2}$$

- Q7. The angular speed of a motor wheel is increased from 1200 rps to 3120 rps in 16 s.
- (a) What is its angular acceleration assuming that the acceleration is uniform?
- (b) How many revolutions does the motor wheel make during this time?
- Q8. A particle of mass  $m$  describes a circle of radius  $r$ . The centripetal acceleration of the particle is  $\frac{4}{r^2}$ . What will be the momentum associated with the particle?
- Q9. A wheel having a moment of inertia of  $2 \text{ kg m}^2$  about its vertical axis rotates at a rate of 60 rps about this axis. The torque required to stop the wheel's rotation in one minute would be

(Hint: *torque = moment of inertia  $\times$  angular acceleration*)

- (a)  $\frac{\pi}{12} \text{ N m}$       (b)  $\frac{2\pi}{15} \text{ N m}$       (c)  $4\pi \text{ N m}$       (d)  $\frac{5\pi}{12} \text{ N m}$

- Q10. Derive the following equations of motion for rotational motion.

(a)  $\theta = \omega_0 t + \frac{1}{2} \alpha t^2$

(b)  $\omega^2 = \omega_0^2 + 2\alpha\theta$