What is Rotational Motion?

Worksheet

Rotational motion is the motion of an object around an axis, described by angular displacement (), angular velocity (= /t), and angular acceleration (= /t), with torque = I driving changes in spin, just as force drives changes in linear motion.

I =

Questions

1. Which quantity is the rotational analog of force?

A) Torque
B) Momentum
C) Velocity
D) Mass

2. A disk has moment of inertia 4 kgm and angular acceleration 3 rad/s. What is the torque?

A) 7 Nm
B) 12 Nm
C) 1.33 Nm
D) 0.75 Nm

3. What is the unit of angular acceleration?

A) m/s
B) rad/s
C) Nm
D) kgm

4. What determines an object's moment of inertia?

A) Only its total mass
B) Its mass and how that mass is distributed relative to the axis
C) Only its shape
D) Its angular velocity

5. A wheel starts from rest and reaches an angular velocity of 20 rad/s in 4 s. Find its angular acceleration.

6. A torque of 12 Nm is applied to a disk with moment of inertia 3 kgm. Find the angular acceleration.

7. A rotor with moment of inertia 2 kgm needs an angular acceleration of 6 rad/s. Find the required torque.

8. Define: What is rotational motion?

9. Define: What is torque?

10. Define: What is moment of inertia?

Answer Key

1. A) Torque - Torque = I mirrors F = ma from linear motion.
2. B) 12 Nm - = I = 4 3 = 12 Nm.
3. B) rad/s - Angular acceleration is measured in radians per second squared.
4. B) Its mass and how that mass is distributed relative to the axis - I = mr - distance of mass from the rotation axis matters, not just total mass.
5. = /t = 20/4 = 5 rad/s
6. = /I = 12/3 = 4 rad/s
7. = I = 2 6 = 12 Nm
8. Motion of an object around a fixed axis, described by angle, angular velocity, and angular acceleration.
9. The rotational analog of force; = I.
10. An object's resistance to a change in rotational motion, depending on mass distribution.