Assignment 5

Mechanical Engineering

Unit 7 - Week 5

1. A solid frictionless cylinder of radius a rolls without slipping on a horizontal surface. If the mass of the cylinder is m, what is the angular acceleration of the cylinder when it is released from rest at an angle θ with the horizontal? (Assume there is no friction between the cylinder and the surface.)

2. A pendulum is in motion with an angle θ from the vertical. If the length of the pendulum is l and the mass of the pendulum bob is m, what is the angular momentum of the pendulum bob with respect to the pivot point?

3. A toy car of mass m is traveling on a horizontal surface with a velocity v. If the car experiences a constant force F acting on it, what is the acceleration of the car?

4. A rigid body has a moment of inertia I about an axis of rotation. If a torque τ is applied to the body, what is the angular acceleration of the body?

5. A car of mass m is moving on a circular track with a radius r. If the car experiences a centripetal force F_c, what is the angular velocity of the car?

6. A solid frictionless disc of radius a is rotating about a fixed axis. If the mass of the disc is m, what is the moment of inertia of the disc about the axis of rotation?

7. A均には identical solid frictionless cylinders of radius a are placed side by side. If the mass of each cylinder is m, what is the center of mass of the system?

8. A solid frictionless disk of radius a and mass m is rotating about a fixed axis. If a torque τ is applied to the disk, what is the angular acceleration of the disk?

9. A solid frictionless cylinder of radius a is rolling without slipping on a horizontal surface. If the mass of the cylinder is m, what is the angular momentum of the cylinder about its center of mass?