CSD2301 Practice
15. **Angular Momentum**

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Practice Question 1

A woman with mass 50 kg is standing on the rim of a large disk that is rotating at 0.50 rev/s about an axis through its center. The disk has a mass 110 kg and radius 4.0 m. Calculate the magnitude of the total angular momentum of the woman-plus-disk system. Assume that you can treat the person as a point in your calculation.

Practice Question 2

Find the magnitude of the angular momentum of the second hand on a clock about an axis through the center of the clock face. The clock hand has a length of 15.0 cm and a mass of 6.00 g. Take the second hand to be a slender rod rotating with constant angular velocity about one end.

Practice Question 3

A diver jumps off a board with arms straight up and legs straight down, giving her a moment of inertia about her rotation axis of 18 kgm^2. She then tucks into a small ball, decreasing this moment of inertia to 3.6 kgm^2. While tucked, she makes two complete revolutions in 1.0 s. If she hadn't tucked at all, how many revolutions would she have made in the 1.5 s from board to water?

Practice Question 4

A hollow thin walled sphere of mass 12.0 kg and diameter 48.0 cm is rotating about an axle through its center. The angle (in radians) through which it turns as a function of time (in seconds) is given by $\theta(t) = At^2 + Bt^4$, where A has a numerical value of 1.50 and B has a numerical value of 1.10. (a) What are the units of the constants A and B? (b) At the time 3.00 s find (i) the angular momentum of the sphere and (ii) the net torque on the sphere.

Practice Question 5

A large wooden turntable in the shape of a flat uniform disk has a radius of 2.00 m and a total mass of 120 kg. The turntable is initially rotating at 3.00 rad/s about a vertical axis through its center. Suddenly, a 70.0 kg parachutist makes a soft landing on the turntable at a point near the outer edge. (a) Find the angular speed of the turntable after the parachutist lands. (Assume that you can treat the parachutist as a particle.) (b) Compute the kinetic energy of the system before and after the parachutist lands. Why are these kinetic energies not equal?