Quiz No. 1

Monday, October 25, 2004

This is a CLOSED-BOOK, open-notes Quiz.

Problem 1   (20 points)

Servomotors make the flywheel spin at a constant rate ω_2, and also impose a vertical rotation rate ω_1 that is a function of time (see figure below). The center of mass of the flywheel is located on the z axis, and the centroidal moments of inertia are I_1 about the spin axis and I_2 transverse to that axis.

(a) Derive the equations of motion for the system.

(b) Determine the external torques necessary to maintain the above motion.
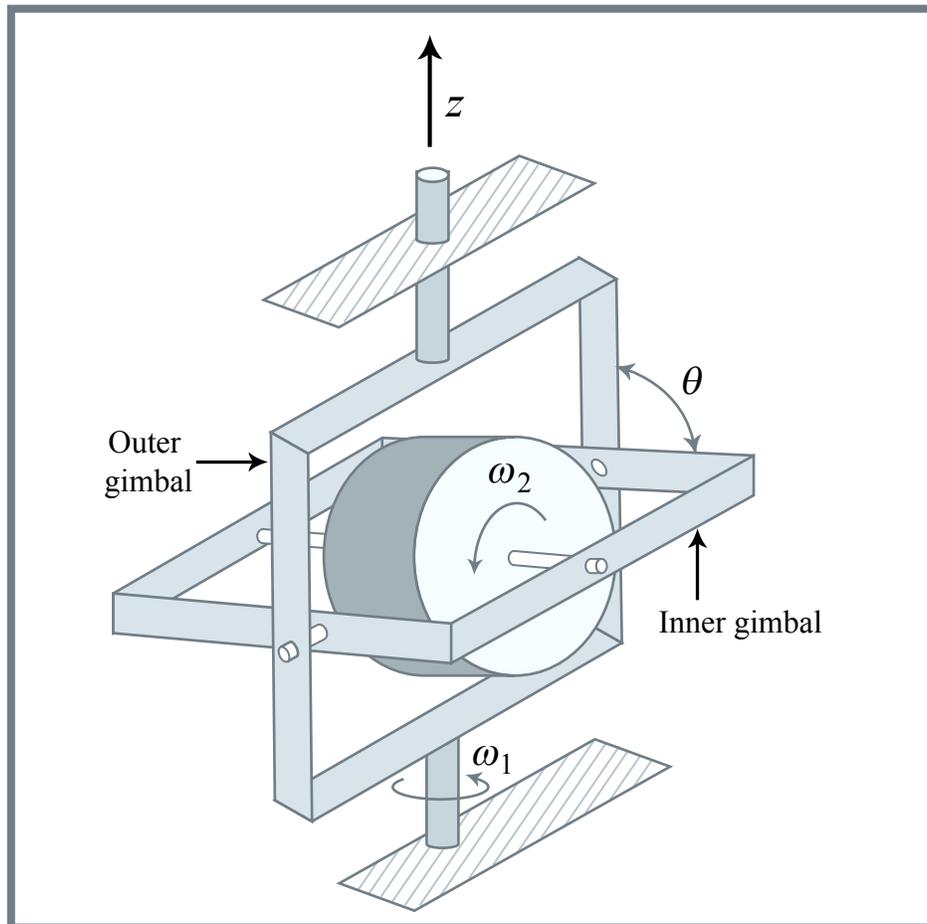

Figure by OCW.

Problem 2   (20 points)

A solid uniform cylinder of mass m and radius R is placed on top of a fixed cylinder of the same radius, and it is slightly tipped, as shown in the figure. Find the value of the angle θ at which sliding begins as a function of the static friction coefficient μ.