

Homework H.6.C

Given: Two homogeneous cylinders, each of mass m and having outer radii of $3R$ and R , are able to roll without slipping on a rough inclined surface. Bar B, having a mass of m , is connected on one end to the center of one disk and is supported by the top surface of disk A, as shown in the figure. Bar B does not slip on disk A as the system moves. A spring of stiffness k is attached between the center O of the upper disk and ground. Let x represent the motion of the disk center O along the incline, where $x = 0$ when the spring is unstretched.

Find: For this problem:

- Derive the dynamical equation of motion (EOM) of the system in terms of the coordinate x ;
- Write down the dynamical EOM of the system in terms of the coordinate $z = x - x_{st}$, where x_{st} is the x -position of O when the system is in static equilibrium.
- Determine undamped natural frequency ω_n for the system.

