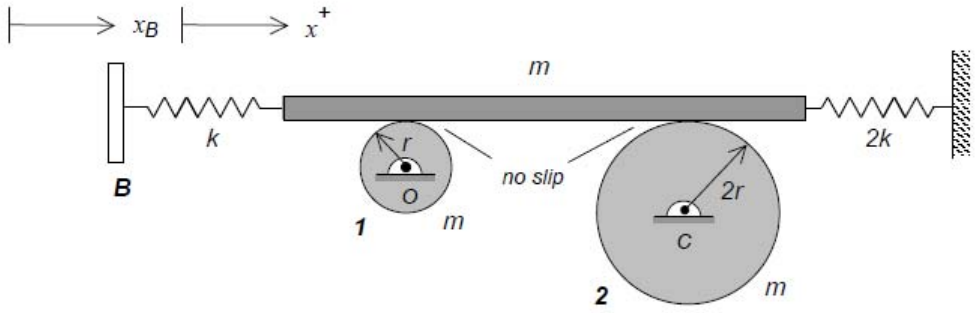
Homework H.6.M

Given: A system is made up of two homogeneous disks and a bar, each of which has a mass of m. The two disks are pinned to ground at their centroids, O and C, as shown below. The bar is able to translate without slipping at its contact points with the disks. A spring of stiffness $2k$ is attached between the right end of the bar and the fixed wall. A second spring, of stiffness k, is attached between the left end of the bar and block B. Block B is given a prescribed motion of $x_B = b \sin \omega t$. Let x represent the translation of the bar, with $x = x_B = 0$ m corresponding to the state where the springs are unstretched.

Find: For this problem:
(a) Draw a free body diagram for each disk and the block;
(b) Derive the single differential equation of motion for the system in terms of the coordinate x; and
(c) Determine the natural frequency of the system.



Use the following parameters in your analysis: $m = 20$ kg and $k = 1000$ N/m.