

Advanced engineering dynamics, 5C1150

Hand in assignments, batch 3, HT 2006

Due Thursday 5/10

1) Two homogeneous circular discs in a vertical plane, both of radius a and mass M , with rough circumferences, are kept in contact by a linkage AB between the midpoints. The linkage is a thin homogeneous rod of mass m and length $2a$. The midpoint of one of the discs is fixed and a rotational motion about this midpoint is enforced in such a way that its orientation angle is $\theta(t)$. Assume that $\alpha = \ddot{\theta}$ is constant. Find the equations of motion and calculate the angular velocity $\dot{\varphi}$ of the linkage as a function of the angle φ .

Assume that before $t = 0$ the system is at rest with the linkage AB hanging vertically down. How large must the angular acceleration α be in order for the linkage AB to become horizontal in the ensuing motion?

Answer:

$$\alpha > \frac{4g}{\pi a} \left(1 + \frac{m}{2M} \right)$$

