MECH230 - Fall 2024
Recommended Problems - Set 18

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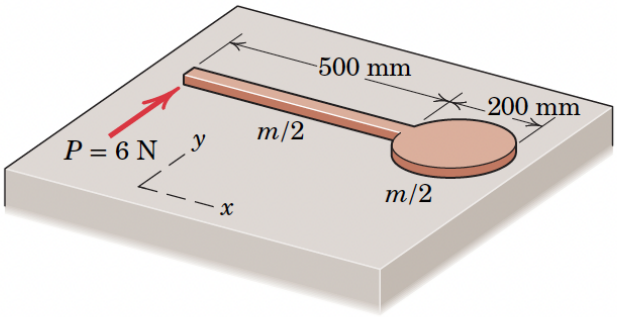
These problems are taken from J. L. Meriam, L. G. Kraige, and J. N. Bolton (MKB), Engineering Mechanics: Dynamics, Ninth Edition, Wiley, New York, 2018.

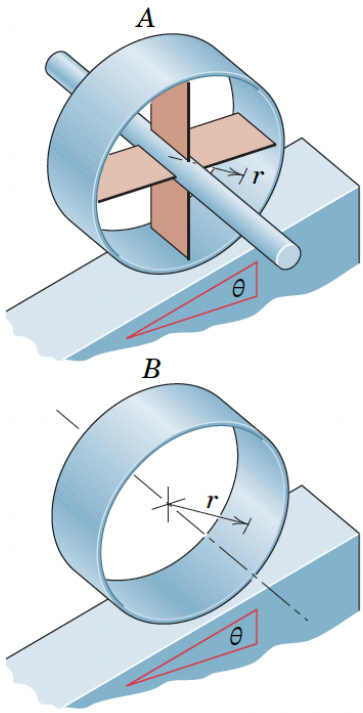
1. [MKB 06-061]

6/61 The body consists of a uniform slender bar and a uniform disk, each of mass $m/2$. It rests on a smooth surface. Determine the angular acceleration α and the acceleration of the mass center of the body when the force $P = 6$ N is applied as shown. The value of the mass m of the entire body is 1.2 kg.



PROBLEM 6/61

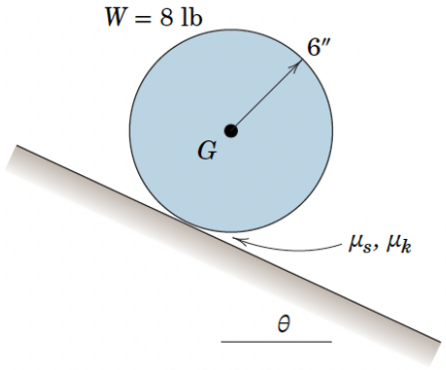
6/62 Determine the angular acceleration of each of the two wheels as they roll without slipping down the inclines. For wheel A investigate the case where the mass of the rim and spokes is negligible and the mass of the bar is concentrated along its centerline. For wheel B assume that the thickness of the rim is negligible compared with its radius so that all of the mass is concentrated in the rim. Also specify the minimum coefficient of static friction μ_s required to prevent each wheel from slipping.



PROBLEM 6/62

3. [06-063]

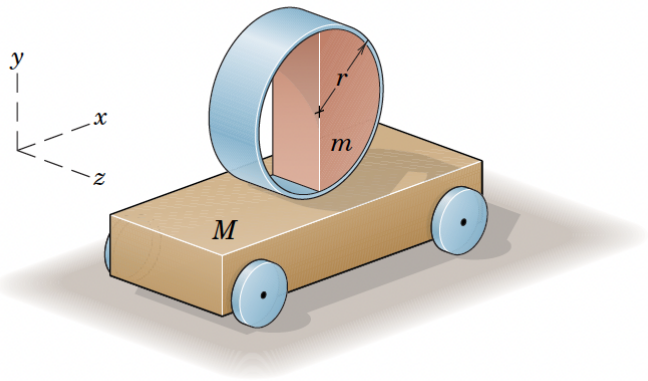
6/63 The solid homogeneous cylinder is released from rest on the ramp. If $\theta = 40°$, $\mu_s = 0.30$, and $\mu_k = 0.20$, determine the acceleration of the mass center G and the friction force exerted by the ramp on the cylinder.



PROBLEM 6/63

4. [06-070]

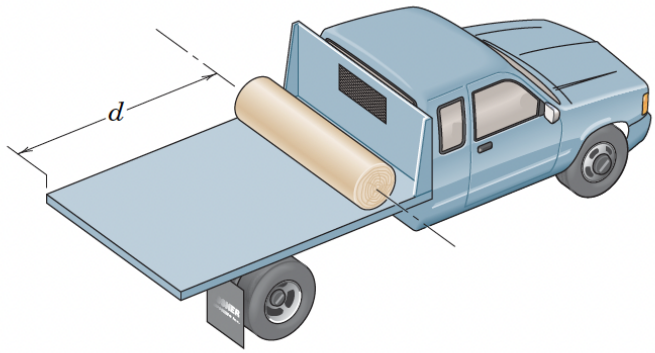
6/70 The system of Prob. 6/18 is repeated here. If the hoop- and semicylinder-assembly is centered on the top of the stationary cart and the system is released from rest, determine the initial acceleration a of the cart and the angular acceleration α of the hoop and semicylinder. Friction between the hoop and cart is sufficient to prevent slip. Motion takes place in the x-y plane. Neglect the mass of the cart wheels and any friction in the wheel bearings.



PROBLEM 6/70

5. [06-076]

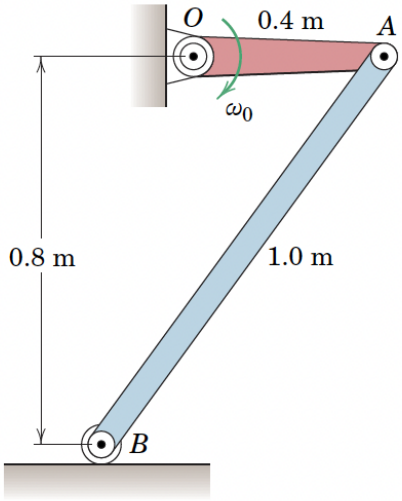
6/76 The truck, initially at rest with a solid cylindrical roll of paper in the position shown, moves forward with a constant acceleration a. Find the distance s which the truck goes before the paper rolls off the edge of its horizontal bed. Friction is sufficient to prevent slipping.



PROBLEM 6/76

6. [06-077]

6/77 The crank OA rotates in the vertical plane with a constant clockwise angular velocity ω_0 of 4.5 rad/s. For the position where OA is horizontal, calculate the force under the light roller B of the 10-kg slender bar AB.



PROBLEM 6/77