Submit your complete solution via MyCourses by Monday Nov 30, 23.59.
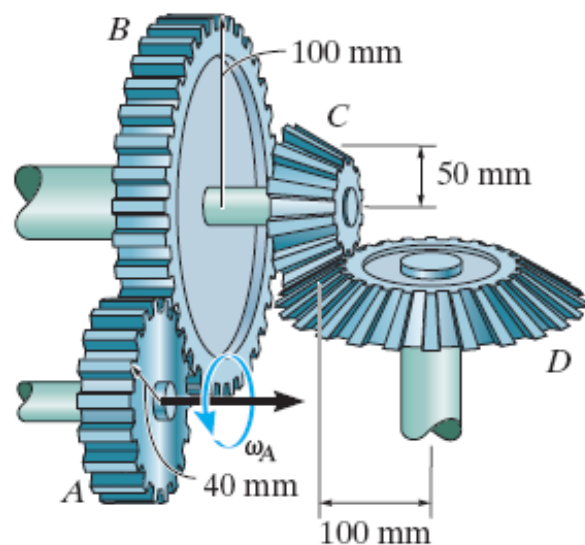
Exercise 1
The pipe has a mass of 460 kg and is held in place on the truck bed using the two boards A and B. Determine the greatest acceleration of the truck so that the pipe begins to lose contact at A and the bed of the truck and starts to pivot about B. Also, what force does board B exert on the pipe for this acceleration?
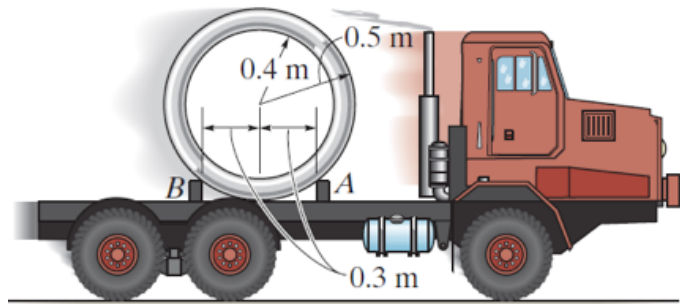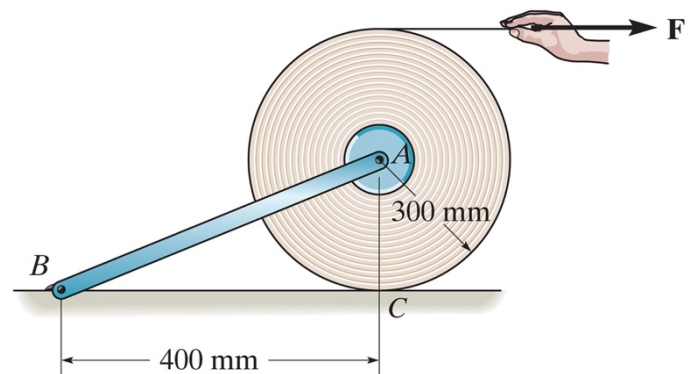

Exercise 2
If the motor turns gear A with an angular acceleration $\alpha_A = 3$ rad/s² when the angular velocity is $\omega_A = 60$ rad/s, determine the angular acceleration and angular velocity of gear D.

Answer: $\omega_D = 12$ rad/s; $\alpha_D = 0.6$ rad/s²

Exercise 3
The 20-kg roll of paper has a radius of gyration $k_A = 120$ mm about an axis passing through point A. It is pin supported at both ends A and B. The roll rests on the floor, for which the coefficient of kinetic friction is $\mu_k = 0.2$. If a horizontal force $F = 60$ N is applied to the end of the paper, determine the initial angular acceleration of the roll as the paper unrolls.

Exercise 4

Determine the moment of inertia about an axis perpendicular to the page and passing through the pin at O. The thin plate has a hole in its center. Its thickness is 50 mm, and the material has a density $\rho = 50$ kg/m^3.

Answer: $I_O = 6.23$ kgm^2

150 mm

1.40 m   1.40 m

O
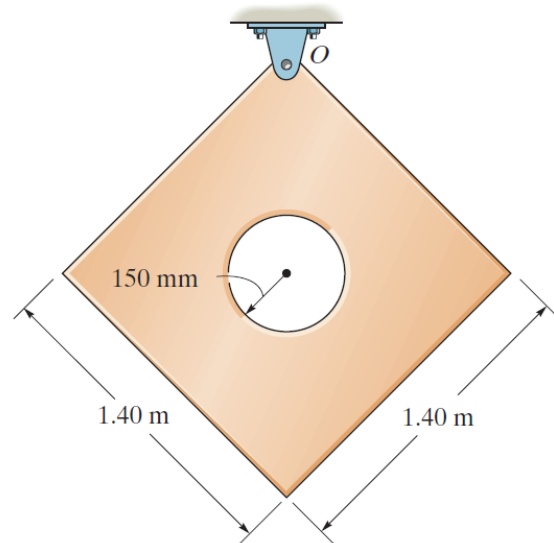
Exercise 5

The slender 6-kg bar AB is horizontal and at rest and the spring is unstretched. Determine the angular velocity of the bar when it has rotated clockwise 45° after being released. The spring has a stiffness of $k = 12$ N/m.

C

k 1.5 m

A B

2 m