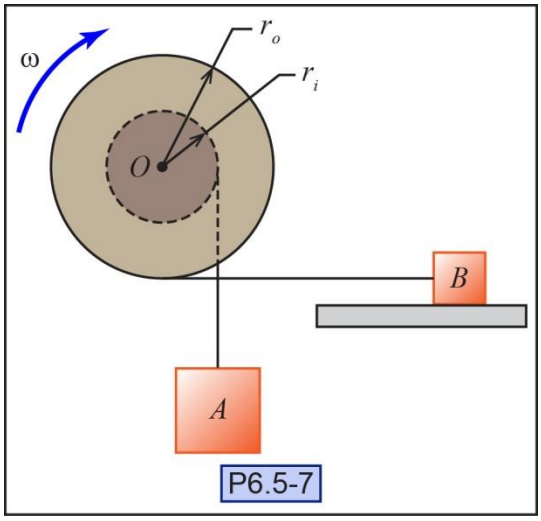
P6.5-7) A flywheel rotates freely on a shaft located at its center (point O). The flywheel has a mass moment of inertia about its mass center of I_o = 0.2 kg-m^2 and is attached to two masses as shown in the figure. Mass A (m_A = 50 kg) is attached to the inner radius (r_i = 10 cm) of the flywheel though an inextensible rope. Mass B (m_B = 20 kg) slides along a rough horizontal surface (μ_k = 0.3) and is attached to the flywheel's outer radius (r_o = 20 cm) through an inextensible rope. If the flywheel is released from rest, calculate the wheel's angular velocity after mass B has moved 10 cm.

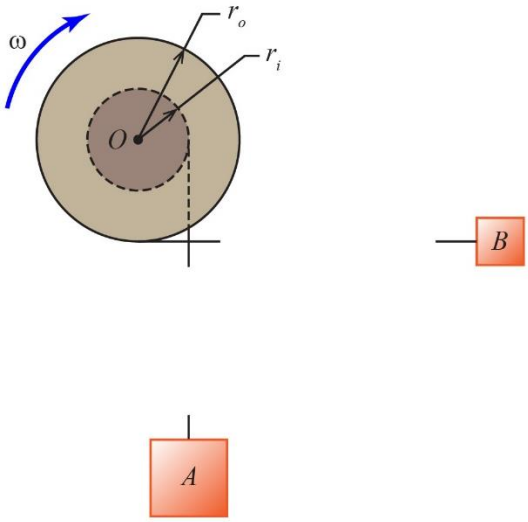


Given:

Find:

Solution:

Draw a free-body diagram for each body.



Write down the equation of motion for each body as a function of the given parameters, rope tensions, and the accelerations.

A:

B:

Flywheel:

Relate the angular acceleration to the linear accelerations.

a_A = _____ α

a_B = _____ α

Determine the angular acceleration of the flywheel.

Use the 3 equations of motion and the acceleration relationships.

α = _____

Use kinematic relationships to determine the angular velocity of the flywheel after *B* has moved 10 cm.

Calculate the change in angular position of the flywheel.

$\Delta\theta$ = _____

Calculate the angular speed.

ω = _____