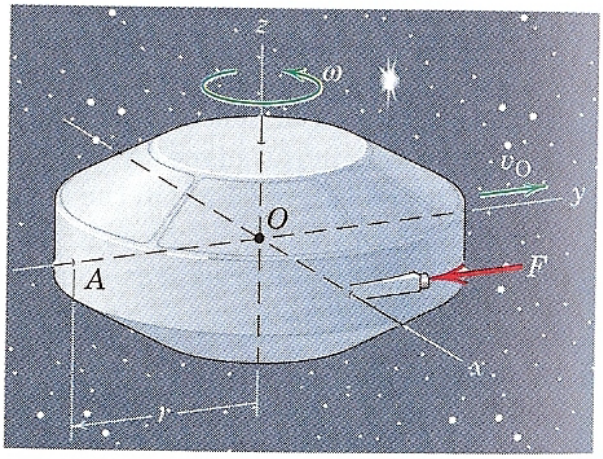
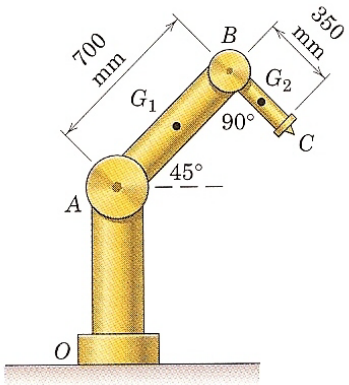
Homework #8 Dynamics

1. The spacecraft is spinning with a constant angular velocity ω about the z-axis at the same time that its mass center O is traveling with a velocity v_O in the y-direction. If a tangential hydrogen-peroxide jet is fired when the craft is in the position shown, determine the expression for the absolute acceleration of point A on the spacecraft rim at the instant the jet force is F. The radius of gyration of the craft about the z-axis is k, and its mass is m.

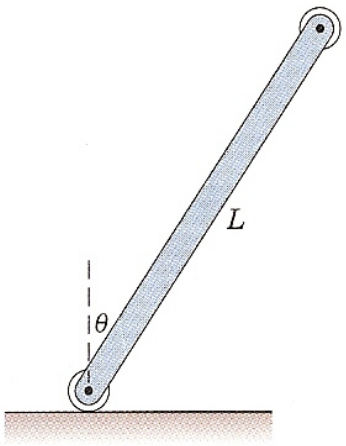


2. **robotic device of HW7 is repeated**

Member AB is rotating about joint A with a counterclockwise angular velocity of 2 rad/s, and this rate is increasing at 4 rad/s^2. Determine the moment M_B exerted by arm AB on arm BC if joint B is held in a locked condition. The mass of arm BC is 4 kg, and the arm may be treated as a uniform slender rod.



3. The uniform slender bar of mass m and length L with small end rollers is released from rest in the position shown with the lower roller in contact with the horizontal plane. Determine the normal force N under the lower roller and the angular acceleration α of the bar immediately after release.



4. A 120-mm-diameter hole is cut as shown in a thin disk of 600-mm diameter. The disk rotates in a horizontal plane about its geometric center A at the constant rate of 480 rpm. Knowing that the disk has a mass of 30 kg after the hole has been cut, determine the horizontal component of the force exerted by the shaft on the disk at A.

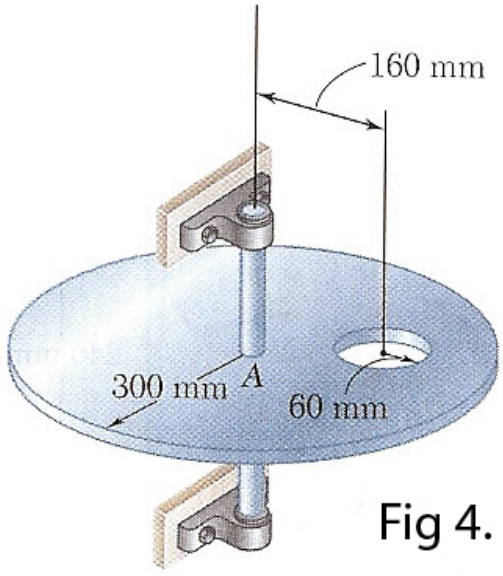


Fig 4.

5. Gear C has a mass of 5 kg and a centroidal radius of gyration of 75 mm. The uniform bar AB has a mass of 3 kg and gear D is stationary. If the system is released from rest in the position shown, determine (a) the angular acceleration of gear C, (b) the acceleration of point B.

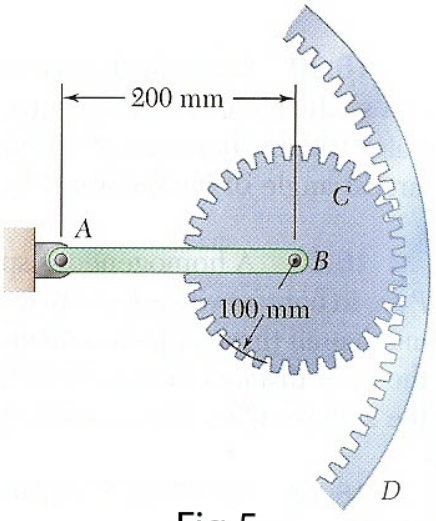


Fig 5.