1. The 50-kg flywheel shown in Fig. 1 has radius of gyration \( k_O = 200 \text{ mm} \) about its center of mass. If it is subjected to a torque \( M = (9\theta^{1/2}) \text{ N·m} \), where \( \theta \) is in radians, determine its angular velocity when it has rotated 5 revolutions, starting from rest. (6 point)

![Figure 1: Problem 1](image1.png)

2. Determine the velocity of the 50-kg cylinder shown in Fig. 2 after it has descended a distance 2 m. Initially, the system is at rest. The reel has mass 25 kg and radius of gyration \( k_A = 125 \text{ mm} \) about its center of mass \( A \). (7 points)

![Figure 2: Problem 2](image2.png)

3. Gear \( B \) shown in Fig. 3 is rigidly attached to drum \( A \) and is supported by two small rollers at \( E \) and \( D \). Gear \( B \) is in mesh with gear \( C \) and is subjected to a torque \( M = 50 \text{ N·m} \). Determine the angular velocity of the drum after \( C \) has rotated 10 revolutions, starting from rest. Together, gear \( B \) and the drum have mass 100 kg, and their radius of gyration about their rotating axis is 250 mm. Gear \( C \) has mass 30 kg and radius of gyration about its rotating axis 125 mm. (10 points)

![Figure 3: Problem 3](image3.png)

4. If \( P = 200 \text{ N} \) and the 15-kg uniform slender rod shown in Fig. 4 starts from rest at \( \theta = 0^\circ \), determine the rod’s angular velocity at the instant just before \( \theta = 45^\circ \). (12 points)

![Figure 4: Problem 4](image4.png)
5. The tub of the mixer shown in Fig. 5 weighs 70 lb and has radius of gyration \( k_G = 1.3 \) ft about its center of gravity \( G \). If a constant torque \( M = 60 \) lb-ft is applied to the dumping wheel, determine the angular velocity of the tub when it has rotated \( \theta = 90^\circ \). Initially \( \theta = 0^\circ \) and the tub is at rest. (7 points)

![Figure 5: Problem 5](image1)

6. If the chain is released from rest from the position shown in Fig. 6, determine the angular velocity of the pulley after the end \( B \) has risen 2 ft. The pulley weighs 50 lb and has radius of gyration 0.375 ft about its axis of rotation. The chain weighs 6 lb/ft. (10 points)

![Figure 6: Problem 6](image2)