1. The 6-kg circular disk and attached shaft rotate at a constant speed of 10,000 rev/min. If the center of mass of the disk is 0.05 mm off center, determine the magnitudes of the horizontal forces A and B supported by the bearings.

2. A small particle of mass m is attached to two highly tensioned massless wires of length L each in the horizontal direction; hence, the particle is located between the wires. Determine the system natural frequency for small vertical oscillations if the tension T in both wires is assumed to be constant.
3. The hoop is cast on the rough surface such that it has an angular velocity $\omega = 4 \text{ rad/s}$ and an angular deceleration $\alpha = 5 \text{ rad/s}^2$. Also, its center has a velocity of $v_O = 5 \text{ m/s}$ and a deceleration $a_O = 2 \text{ m/s}^2$. Determine the acceleration of point $A$ at this instant.

4. The 10-kg rod $AB$ shown in the figure is confined so that its ends move in the horizontal and vertical slots. The spring has a stiffness of $k = 800 \text{ N/m}$ and is unstretched when $\theta = 0^\circ$. Determine the angular velocity of $AB$ when $\theta = 60^\circ$. If $AB$ is released from rest when $\theta = 30^\circ$, neglect the mass of the slider blocks.
5. The structure shown is composed of eight two-force members of equal length \( \ell \) and a rigid frame BCD of length \( 2\ell \). All members in the structure are pin-connected together and their weights are ignored. If the structure is subjected to a vertical downward force \( P \) at joint G, determine the axial force in member CG.

\[ \text{(16 \%)} \]

6. Two rigid bars AB and BC of negligible weight are attached to a rotational spring of constant \( K \) at point B. The rotational spring obeys the Hooke’s law, \( M = K \theta \), where \( M \) is an applying moment and \( \theta \) the deformed angle. The spring is undeformed when the bars are horizontal. Two equal and opposite, horizontal forces \( P \) and \( -P \) are applied at both ends A and C. Determine the range of the magnitude \( P \) for which the equilibrium of the system is stable in the position shown.

\[ \text{(16 \%)} \]