a) What is the rotational inertia of the rigid structure about the rotational axis?

Since the structure consists of a hoop and square, the total rotational inertia is

\[ I_{\text{tot}} = I_{H} + I_{S} \]

According to the parallel axis theorem, the rotational inertia of the hoop about the axis through its rim is

\[ I_{H} = \frac{1}{2} mR^2 + mR^2 = \frac{3}{2} mR^2 = 1.47 \text{ kg} \cdot \text{m}^2 \]

The square consists of a rod along the axis, two rods with the axis at one end and a rod a distance \( L \) away from the axis. The parallel axis theorem yields

\[ I_{S} = 0 + 2 \times \left( \frac{1}{12} ML^2 + \frac{1}{2} ML^2 \right) + ML^2 = \frac{5}{3} ML^2 = 1.60 \text{ kg} \cdot \text{m}^2 \]

The rotational inertia of the structure is

\[ I_{\text{tot}} = I_{H} + I_{S} = 3.07 \text{ kg} \cdot \text{m}^2 \]

b) What is the angular momentum about the rotational axis?

The angular velocity of the structure is

\[ \omega = \frac{2\pi}{T} = 1.26 \text{ rad/s} \]

By definition, the angular momentum of the structure is

\[ l = I_{\text{tot}} \omega = 3.86 \text{ kg} \cdot \text{m}^2 / \text{s} \]