Problem 1

The Ferris Wheel shown below can be approximated as a thin circular ring with a diameter of 96 meters and a mass of 20,000 kg. What is the power required from a motor in order to bring the Ferris wheel from rest to its operating speed of 0.5 rotations per minute over the course of 15 seconds?

thin circular ring

$$I = mr^2 = 46.08 \times 10^6 \text{ kg·m}^2$$

$$W_f = .5 \text{ rpm} = .05236 \text{ rad/s}$$

$$P = \frac{W}{t} = \frac{\Delta KE}{t}$$

$$P = \frac{\frac{1}{2} I W_f^2 - \frac{1}{2} I \cancel{W_i^2}}{t} = \frac{\frac{1}{2}(46.08 \times 10^6 \text{ kg·m}^2)(.05236 \text{ rad/s})^2}{15 s}$$

$$\boxed{P = 4211 \text{ W} = 4.21 \text{ kW}}$$