Answer on Question #74092, Physics / Mechanics | Relativity |

a wheel has a moment of inertia of 2.0 kgm2 about its axis of rotation. It is rotating with an angular speed of 50rpm. Calculate the torque that can stop the wheel in one minute. Also calculate work done by the torque in this time.

Answer:

We have:

moment of inertia$I = 2.0kg \cdot m^2$;

angular velocity$\omega = 50rpm = \frac{50 \cdot 2\pi}{60}\frac{rad}{s} = \frac{5\pi}{3}\frac{rad}{s}$;

time$t = 1m = 60s$.

The angular momentum of the wheel is $L = I\omega = \frac{10\pi}{3}\frac{kg \cdot m^2}{s}$.

The torgue is $\tau = \frac{\Delta L}{\Delta t} = \frac{L}{t} = \frac{\pi}{18}\frac{kg \cdot m^2}{s^2}$.

Work done by the torque in this time is

$$W = \frac{I\omega^2}{2} = \frac{25\pi^2}{9}J.$$