• 例題 11.11

一轉動慣量為 45 kg · m^2 的輪子在 10 s 內由 20 rpm 加速到 100 rpm。其所需的平均功率為何？

解

已知

$$f_1 = 20 \text{ rpm} = \frac{20}{60} \text{ rps} = \frac{1}{3} \text{ rps} \Rightarrow \omega_1 = 2\pi f_1 = \frac{2\pi}{3} \text{ rad/s}$$

$$f_1 = 100 \text{ rpm} = \frac{100}{60} \text{ rps} = \frac{5}{3} \text{ rps} \Rightarrow \omega_2 = 2\pi f_2 = \frac{10\pi}{3} \text{ rad/s}$$

動能增加量：$\Delta K = \frac{1}{2} I\omega_2^2 - \frac{1}{2} I\omega_1^2$

$$= \frac{1}{2} \times (45) \times (\frac{10\pi}{3})^2 - \frac{1}{2} \times (45) \times (\frac{2\pi}{3})^2$$

$$\div 2370 \text{ J}$$

$$P = \frac{\Delta K}{t} = \frac{2370}{10} = 237 \text{ W}$$