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(3) $\theta = \frac{\ell}{r}$

$\ell = \theta r = (1.4 \times 10^{-5}\ \text{rad})(380000 \times 10^{3}\ \text{m})$

$= \underline{5300\ \text{m}}$

(4) $f = 6500\ \text{rpm} = 108.3\ \text{Hz}$

$\omega = 2\pi f = 2\pi(108.3\ \text{Hz}) = 680.68\ \text{rad s}^{-1}$

$\omega_f = \omega_i + \alpha t$

$\alpha = \frac{\omega_f - \omega_i}{t} = \frac{-680.68\ \text{rad s}^{-1}}{3.0\text{s}} = \underline{230\ \text{rad s}^{-2}}$

(5) $\theta = \frac{\ell}{r}$ $\qquad \theta = 15(2\pi\ \text{rad}) = 30\pi\ \text{rad}$

$\ell = 3.5\text{m}$

$r = \frac{\ell}{\theta} = \frac{3.5\text{m}}{30\pi\ \text{rad}} = 0.037\text{m}$

diameter $= 2r = 2(0.037\text{m}) = \underline{0.074\text{m}}$

(7) (a) $\omega = 2\pi f$

$= 2\pi\left(\frac{2500\ \text{rpm}}{60\ \text{sec min}^{-1}}\right)$

$= 261.8 = \underline{260\ \text{rad s}^{-1}}$

(b) $v = \omega r = (261.8\ \text{rad s}^{-1})(0.175\text{m}) = 45.815\ \text{ms}^{-1} = \underline{46\ \text{ms}^{-1}}$

$a = \frac{v^2}{r} = \frac{(45.8\ \text{ms}^{-1})^2}{0.175\text{m}} = 261.8 = \underline{260\ \text{ms}^{-2}}$

(9) $\omega = 2\pi f = \frac{2\pi}{T}$

(a) $T = 365 \text{ days} = 3.15 \times 10^7 \text{ s}$

$\omega = \frac{2\pi}{3.15 \times 10^7 \text{ s}} = \underline{1.99 \times 10^{-7} \text{ rad s}^{-1}}$

(b) $T = 24 \text{ hours} = 86400 \text{ s}$

$\omega = \frac{2\pi}{86400 \text{ s}} = \underline{7.3 \times 10^{-5} \text{ rad s}^{-1}}$

(13) linear velocities of the two turn tables must be equal at the point of contact.

$v_1 = \omega_1 R_1 \qquad v_2 = \omega_2 R_2$

$v_1 = v_2$

$\omega_1 R_1 = \omega_2 R_2$

$\frac{\omega_1}{\omega_2} = \frac{R_2}{R_1}$