Ch. 8b answers

1) $M = 5kg$
$r = 2m$
$\omega = \frac{40 \text{ rev}}{60 s}\left(\frac{2\pi \text{ rad}}{1 \text{ rev}}\right)$
$\omega = 4.19 \frac{rad}{s}$

$L = mr^2\omega$
$= 5kg(2m)^2\left(4.19 \frac{rad}{s}\right)$

$\boxed{L = 33.5 \frac{kg\,m^2}{s}}$

2) $M = 0.45kg$
$r = 0.14m$
$v = 15 \frac{m}{s}$

$K_T = \frac{1}{2}mv^2$
$= \frac{1}{2}(0.45kg)\left(15 \frac{m}{s}\right)^2$

$\boxed{K_T = 50.6\,J}$

$K_R = \frac{1}{2}I\omega^2$
$= \frac{1}{2}\left(\frac{2}{3}mR^2\right)\left(\frac{v^2}{R^2}\right)$

$K_R = \frac{1}{3}mv^2$
$= \frac{1}{3}(0.45kg)\left(15 \frac{m}{s}\right)^2$

$\boxed{K_R = 33.8\,J}$

$K_{TOT} = K_T + K_R$
$= 50.6\,J + 33.8\,J$

$\boxed{K_{TOT} = 88.4\,J}$

$\frac{K_T}{K_{TOT}} = \frac{50.6\,J}{88.4\,J}$

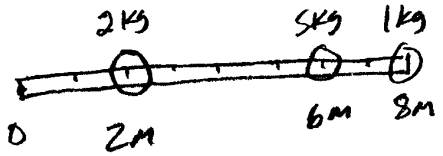
$\boxed{\frac{K_T}{K_{TOT}} = 57.2\%}$

3) $\tau = 8Nm$
$\alpha = 20 \frac{rad}{s^2}$
$m = 50kg$
$r = \_\_\_ m$

$\tau = I\alpha$
$\tau = mR^2\alpha$
$R = \sqrt{\frac{\tau}{m\alpha}}$

$R = \sqrt{\frac{8Nm}{50kg\left(20 \frac{rad}{s^2}\right)}}$

$\boxed{R = 0.0894\,m}$

4) 

$I_L = \Sigma mR^2$
$= 2kg(2m)^2 + 5kg(6m)^2 + 1kg(8m)^2$

$\boxed{I_L = 252\,kg\,m^2}$

5) $\omega_i = 0 \frac{rad}{s}$

$\omega_f = 1.6 \frac{rad}{s}$

$t = 9s$

$R = 8M$

$M = 31000kg$

$\tau = I\alpha$

$= \frac{1}{2}MR^2\left(\frac{\omega_f - \omega_i}{t}\right)$

$= \frac{1}{2}(31000kg)(8m)^2\left(\frac{1.6\frac{rad}{s}}{9s}\right)$

$\boxed{\tau = 1.76 \times 10^5 Nm}$

6) $\omega_1 = 15 \frac{rad}{s}$

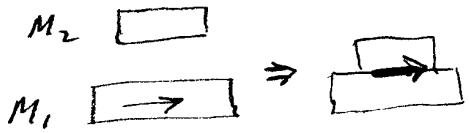
$M_1 = 5kg$

$R_1 = 0.2m$

$M_2 = 7kg$

$R_2 = 0.3m$

$\omega_f = \_\_\_ \frac{rad}{s}$



$L_i = L_f$

$I_i\omega_i = I_f\omega_f$

$\frac{1}{2}M_1R_1^2\omega_1 = \left(\frac{1}{2}M_1R_1^2 + \frac{1}{2}M_2R_2^2\right)\omega_f$

$\omega_f = \frac{M_1R_1^2\omega_1}{M_1R_1^2 + M_2R_2^2}$

$= \frac{5kg(0.2m)^2(15\frac{rad}{s})}{5kg(0.2m)^2 + 7kg(0.3m)^2}$

$\boxed{\omega_f = 3.161 \frac{rad}{s}}$

7) $\omega = \frac{10000 rev}{60\ s}\left(\frac{2\pi\ rad}{1\ rev}\right)$

$\omega_i = 1050 \frac{rad}{s}$

$\omega_f = 0 \frac{rad}{s}$

$\tau = 1.2 Nm$

$m = 4.8kg$

$R = 0.071m$

$n_{rev} = \_\_\_ rev$

$N_{rev} = 1.11 \times 10^4 rad\left(\frac{1\ rev}{2\pi rad}\right)$

$\boxed{N = 1771 rev}$

$\tau = I\alpha$

$\tau = MR^2\frac{(\omega_f - \omega_i)}{t}$

$t = \frac{-MR^2\omega}{-\tau}$

$= \frac{4.8kg(0.071m)^2(1050\frac{rad}{s})}{1.2Nm}$

$t = 21.2s$

$\theta = \left(\frac{\omega_f + \omega_i}{2}\right)t$

$= \left(\frac{1050\frac{rad}{s}}{2}\right)21.2s$

$\theta = 1.11 \times 10^4 rad$