yohandi - assignment 9

14. $\omega_t^2 = \omega_0^2 + 2\theta\alpha$

$(15\ \text{rev/s})^2 = (10\ \text{rev/s})^2 + 2.60\ \text{rev}.\alpha$

a) $\alpha = 1.0417\ \text{rev/s}^2$

b) $\omega_t = \omega_0 + \alpha t$

$t = \frac{\omega_t - \omega_0}{\alpha} = \frac{15-10}{1.0417}\ s = 4.800\ s$

c) $t = \frac{\omega_t - \omega_0}{\alpha} = \frac{10-0}{1.0417}\ s = 9.600\ s$

d) $\theta = \theta_0 + \omega_0 . t + \frac{1}{2}\alpha . t^2$

$\theta = (0 + 0 + \frac{1}{2}.1.0417.96^2)\ \text{rev}$

$= 48\ \text{rev}$

28. $V_A = V_C$

$\omega_A R_A = \omega_C . R_C$

$\omega_C = \frac{\omega_A . R_A}{R_C} = \frac{(\alpha_A . t) R_A}{R_C}$

$\Rightarrow t = \frac{\omega_t . R_C}{\alpha_A . R_A} = \frac{100 . 2\pi . 0.25}{60 . 20 . 0.10}\ s$

$= \frac{250\pi}{60}\ s$

$= \frac{25}{6}\pi\ s = 13\ s$

41 a) $I = (\frac{1}{12}Md^2 + M(\frac{d}{2})^2) + (md^2) + (\frac{1}{12}Md^2 + M(\frac{3d}{2})^2) + (m(2d)^2)$

$= \frac{8}{3}Md^2 + 5md^2$

$= 0.02336\ \text{kg m}^2$

b) $K = \frac{1}{2}I\omega^2 = 0.00105\ J$

51.

$\rightarrow m_2 g - T_2 = m_2 . a \quad ...(1)$

$\rightarrow \tau = I . \alpha$

$(T_2 - T_1) R = \frac{1}{2}MR^2 . \frac{a}{R}$

$T_2 - T_1 = \frac{1}{2}M . a \quad ...(2)$

$\rightarrow T_1 - m_1 . g = m_1 . a \quad ...(2)$

a) $h_0 = h + V_0 . t - \frac{1}{2}at^2$

$-0.75 = 0 + 0 - \frac{1}{2}.a.5.00^2$

$a = 0.06\ \text{m/s}^2\ (\downarrow)$

b) $T_2 = m_2(g - a) = 4.87\ N$

c) $T_1 = m_1(g + a) = 4.5356\ N$

d) $\alpha = \frac{a}{R} = 1.2\ \text{rad/s}^2\ (\curvearrowright)$

e) $I = \frac{\tau}{\alpha} = \frac{(T_2 - T_1)R}{\alpha} = 0.0139\ \text{Kg.m}^2$

53. $\omega_t = \omega_0 + \alpha . t$

$250 = 0 + \alpha . (1.25 - 0)$

$\alpha = 200\ \text{rad/s}^2\ (\curvearrowleft)$

$\rightarrow \tau = I\alpha .$

$(F_2 - F_1) R = I . \alpha$

$(F_2 - F_1) R = \frac{1}{2}MR^2 . \alpha$

$F_2 = F_1 + \frac{1}{2}MR\alpha$

$= (0.100 + \frac{1}{2}.0.02.0.02.200)\ N$

$= 0.140\ N$

56. $I_f = mL_1^2 + mL_2^2 = m(L_1^2 + L_2^2)$

$\rightarrow \tau = I . \alpha$

$mg . L_2 - mg . L_1 = m(L_1^2 + L_2^2) . \alpha$

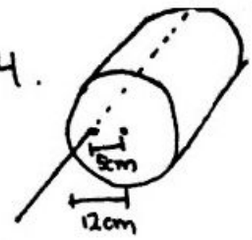
$\frac{g(L_2 - L_1)}{(L_1^2 + L_2^2)} = \alpha$

$\alpha = 8.647\ \text{rad/s}^2\ (\curvearrowright)$

a) $a_1 = \alpha . R_1 = \alpha . L_1 = 1.73\ \text{m/s}^2\ (\uparrow)$

b) $a_2 = \alpha . R_2 = \alpha . L_2 = 6.92\ \text{m/s}^2\ (\downarrow)$

64.



a. $I = I_{com} + Md^2$

$= \frac{1}{2}MR^2 + M(\frac{5}{12}R)^2$

$= \frac{97}{144}MR^2$

$= 0.2425\ \text{kg m}^2$

b. $\Delta K + \Delta U = 0$

$\frac{1}{2}I\omega^2 - mgh = 0$

$\omega = \sqrt{\frac{2mgh}{I}}$

$= \sqrt{\frac{2.(25)(9.8)(0.05)}{0.2425}}\ \text{rad/s}$

$= 10.05\ \text{rad/s}$