Phys101 – Sec # 40 **Quiz # 8 (Chapter 10)**

Name: _____ (Key) **ID #** _____

●**24.** A rope pulls a 1.0-kg box on a frictionless surface through a pulley, as shown in figure 9. The pulley has a rotational inertia of 0.040 kg.m^2 and radius of 20 cm. If the force F is 10 N, what is the acceleration of the box?

for the box

$F_{net} = ma$

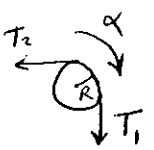
$T_2 = ma$

for the pulley

$T_2 R - T_1 R = -I\alpha$

$(T_2 - T_1)R = -I\frac{a}{R}$

$T_2 - T_1 = -I\frac{a}{R^2}$



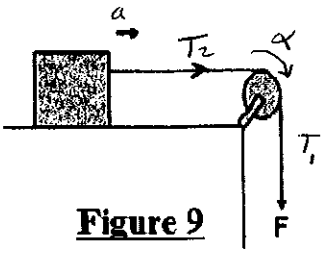


Figure 9

$T_1 = F = 10$

$ma - T_1 = -I\frac{a}{R^2}$

$-maR^2 + T_1R^2 = Ia$

$-(1)a(0.2)^2 + 10(0.2)^2 = 0.04a$

$-0.04a + 0.4 = 0.04a$

$0.08a = 0.4$

$a = \frac{0.4}{0.08} = 5 \ m/s^2$

●●**39** In Fig. 10-36, two particles, each with mass m = 0.85 kg, are fastened to each other, and to a rotation axis at O, by two thin rods, each with length d = 5.6 cm and mass M = 1.2 kg. The combination rotates around the rotation axis with angular speed ω = 0.30 rad/s. Measured about O, what are the combination's (a) rotational inertia and (b) kinetic energy? GO

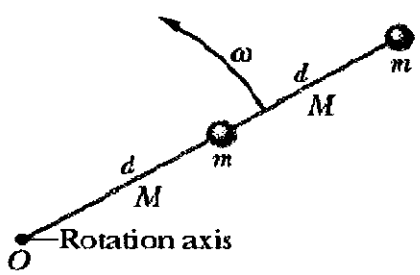


FIG. 10-36 Problem 39.

a) $I = I_{rod} + I_{m_1} + I_{m_2}$ about Point O.

$= \frac{1}{3}(2M)(2d)^2 + md^2 + m(2d)^2$

$= \frac{8}{3}Md^2 + 5md^2 = \frac{8}{3}(1.2)(0.056)^2 + 5(0.85)(0.056)^2$

$= 0.010 + 0.013$

$= 0.023 \ kg\,m^2$

b) $K = \frac{1}{2}I\omega^2 = \frac{1}{2}(0.023)(0.3)^2$

$= 1.035 \times 10^{-3} \ J$