Exam Physics 4A Winter 2015 quiz 6

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g = 9.8 m/s2   1 radian = 360°/2π = 57.3°

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) A wheel rotates through 52 rad while accelerating from rest to its final speed. If its average angular acceleration is 7.7 rad/s^2, how long does it take for the wheel to reach its final speed?

A) 3.7 s B) 5.9 s C) 4.4 s D) 2.6 s

2) A 95-N force exerted at the end of a 0.24-m-long torque wrench gives rise to a torque of 15 N • m. What is the angle (assumed to be less than 90°) between the wrench handle and the direction of the applied force?

A) 41° B) 57° C) 49° D) 33°

3) A solid disk of radius 1.60 m and mass 2.30 kg rolls without slipping to the bottom of an inclined plane. If the angular velocity of the disk is 4.62 rad/s at the bottom, what is the height of the inclined plane?

A) 3.14 m B) 4.18 m C) 3.68 m D) 5.02 m

4) While spinning down from 500.0 rpm to rest, a solid uniform flywheel does 3.5 kJ of work. If the radius of the disk is 1.2 m, what is its mass?

A) 4.0 kg B) 3.0 kg C) 4.6 kg D) 3.5 kg

QUIZ 6

PHYS 4A

WINTER '15

1.)

$\omega_i = 0$; $\theta_f = 52\ \text{rad}$

$\alpha = 7.7\ \text{rad/s}^2$

$$\therefore \theta_f = \omega_i t + \frac{1}{2}\alpha t^2$$

$$\Rightarrow t = \sqrt{\frac{2 \times 52}{7.7}}$$

$$\Rightarrow t \simeq 3.7\text{s}$$

2.)

$|\vec{F}| = 95\text{N}$; $|\vec{\tau}| = 15\text{Nm}$; $|\vec{r}| = 0.24\text{m}$

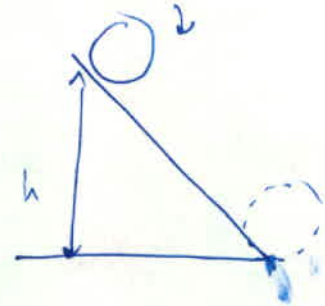
$$\therefore \vec{\tau} = \vec{r} \times \vec{F}$$

$$\Rightarrow |\vec{\tau}| = |\vec{r}|\ |\vec{F}|\ \sin\theta$$

$$\Rightarrow \sin\theta = \frac{15}{95 \times 0.24}$$

$$\Rightarrow \theta \simeq 41^\circ$$

3.) $\Delta U + \Delta K = W_{nc} = 0$.



$U_i = mgh$

$U_f = 0$

$K_i = 0$

$K_f = \frac{1}{2} m v^2 + \frac{1}{2} I \omega^2$

$I = \frac{mR^2}{2}$ & $v = \omega R$

$\therefore \quad -mgh + \frac{1}{2} m (\omega R)^2 + \frac{1}{2}\left(\frac{mR^2}{2}\right)\omega^2 = 0$

$\Rightarrow h = \frac{1}{2g}\left[\omega^2 R^2 + \frac{\omega^2 R^2}{2}\right]$

$\Rightarrow h = \frac{3\omega^2 R^2}{4g}$

$\Rightarrow h = 4.18 \text{ m}$

4.) $W_{nc} = \underbrace{\frac{1}{2} I \omega^2}_{\Delta K} + \cancel{\Delta U} \to 0$

$\Rightarrow 3.5 \times 10^3 \text{ J} = \frac{1}{2} \times \left(\frac{mR^2}{2}\right) \times \left(500 \times \frac{2\pi}{60}\right)^2$

$\Rightarrow m \approx 3.5 \text{ kg}$