Physics for Engineers

Unit 1 test

Problem on p.12:

* Determine area of each part and fraction on total area (which is proportional to m) gives you the mass

Problem at top of p.15:

* Don’t forget that tangential acceleration is 2 times angular acceleration (both pulleys make the rope move)

Problem at bottom of p.15:

* Determine angular acceleration using torque
* Determine linear acceleration using forces in x
* Determine formula for velocity at a given time
* Equal the formula above to formula of angular velocity at a given time times radius (v=wr)
* Find t

Problem on p.16:

* Free body diagram
* Forces in x and in y (do not forget sin(angle) times T in y!)
* Slide without rolling: net torque is 0
* Also set forces in x to 0

Concept test on p.20:

* Use work to solve this problem
* Since both ropes are pulled by the same for force for the same distance, the work done on both is equal
* This work translates to a change in kinetic energy, which is identical for both
* Kinetic energy for a disk is only rotational energy so K = ½ Iw2
* Since I is the same for both wheels, w is also the same

**Lon Capa 1:**

* Use parallel axis theorem when you know moment of inertia about cm! (much easier)

Angular momentum conserved? Ask yourself if there was an external torque or not

Problem at the bottom of p.29:

* Find the center of mass of the final system. This allows us to find the angular momentum about this point before and after the collision
* Find the initial angular momentum
* Find the final moment of inertia (use parallel axis theorem!)
* Find angular velocity using L = Iw

Problem on p.30:

* Find the initial angular momentum of the turnstile
* Find the initial angular momentum of the ball
* Find the total initial angular momentum
* Find the final moment of inertia of the system
* Find wfinal using L = Iw

Problem on p.31:

* A) Use parallel axis theorem
* B) Use torque
* C) Use energy (angular momentum is not conserved because there is external torque)
* D) Use angular momentum before/after
* Don’t forget to take into account the sign of the angular momentum!
* Find the height attained by the new center of mass using energy
* Find the new center of mass
* Find the angle by subtracting height attained from cm, dividing this by cm and cos-1

**Lon Capa 2:**

* Question 4: Don’t forget parallel axis theorem
* Question 5 part A: Don’t forget to multiply by length of rod for tangential velocity
* Question 10: Find out what “a” represents for each mass (one is 2 alpha and the other is 0.4 alpha)

Problem on p.37:

Do not forget, when find r for torque, that the components are from point of rotation to force!

**Sample Test:**

* 1. If you are subtracting the moment of inertia of the cylinder later, you subtract from the initial moment of inertia (full mass). Choose a point of reference before calculating cm.