

**Phy 11A/Cizmeciyan**

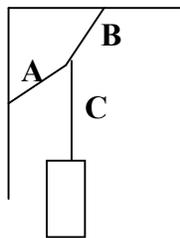
**Final**

**Fall 2003**

Name \_\_\_\_\_

**9Questions+Bonus**

- 1) (8 points) A Ferris wheel which rotates counterclockwise is just starting up. At a given instant a passenger on the rim of the wheel and passing through the lowest point of his circular motion is moving at a  $3.00\text{m/s}$  and is gaining speed at a rate of  $0.500\text{m/s}^2$ 
  - a) Find the magnitude and direction of the passenger's acceleration at this instant.
  - b) Sketch the Ferris wheel and the passenger showing his velocity and acceleration vectors.
  
- 2) (15 points) A spaceship travels in a straight line to the moon. The distance is  $384,000\text{km}$ . Suppose it accelerates at  $20\text{m/s}^2$  for the first 15 mins of the trip, then travels at constant speed until the last 15 min, when it accelerates at  $-20\text{m/s}^2$ , just coming to rest as it reaches the moon.
  - a) What is the maximum speed attained
  - b) What fraction of the total distance is traveled at constant speed?
  - c) What total time is required for the trip?
  
- 3) (8 points) A snowball rolls off a barn roof that slopes downward at an angle  $40^\circ$ . The edge of the roof is  $14\text{m}$  above the ground and the snowball has a speed  $7.00\text{m/s}$  as it rolls off the roof. Ignore air resistance.  
How far from the edge of the barn does the snowball strike the ground?
  
- 4) (12 points) A box of bananas weighing  $40\text{N}$  rests on a surface that makes a  $25^\circ$  with the horizontal. The coefficient of static friction  $\mu_s = 0.40$  and the coefficient of kinetic friction  $\mu_k = 0.20$ .
  - a) What is the friction if there is no force applied to the box of bananas
  - b) What is the magnitude of the friction force if a monkey applies a horizontal force of  $6.0\text{N}$  to the box and the box is initially at rest.
  - c) What minimum horizontal force must the monkey apply to start the box in motion?
  
- 5) (10 points) Find the tension in each cord (cord A, B and C) if the weight of the suspended object is  $w$ ?



- 6) (10 points) A freely rolling 1200 kg car moving at 0.65 m/s is to compress the spring no more than 0.070m before stopping. What should be the force constant of the spring?
- 7) (11 points) A 0.15 kg glider is moving to the right on a horizontal frictionless air track with a speed 0.8m/s. It makes a head on collision with a 0.300kg glider that is moving to the left with a speed of 2.20m/s. Find the final velocity of each glider if the collision is elastic.
- 8) (18 points) A non-uniform beam 4.5m long and weighing 1000N makes an angle 25° with the horizontal. It is held in position by a frictionless pivot at its upper right end and by a cable 3.00m farther down the beam and perpendicular to it. The center of gravity of the beam is 2m down the beam from the pivot. Lighting equipment exerts a 5000N downward force on the lower left end of the beam.
- Find the tension T in the cable
- 9) (9 points) A harmonic oscillator has a mass of 0.5kg and an ideal spring with force constant 140N/m. Find
- The period
  - The frequency
  - The angular frequency

Bonus (5 points) A metal rod is 4.00m long and  $0.5\text{cm}^2$  in cross section area is found to stretch 0.20cm under a tension of 5000N. What is the Young's modulus for this metal?