

Instructor(s): *J. Ipsier*

## PHYSICS DEPARTMENT

PHY 2004

3rd Exam

November 16, 2005

Name (print, last first): \_\_\_\_\_ Signature: \_\_\_\_\_

*On my honor, I have neither given nor received unauthorized aid on this examination.***YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.**

- (1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number).** Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY.** Code your UFID number on your answer sheet.
- (2) Print your name on this sheet and sign it also.
- (3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout with scratch work most questions demand.
- (4) **Blacken the circle of your intended answer completely, using a #2 pencil or blue or black ink.** Do not make any stray marks or some answers may be counted as incorrect.
- (5) The answers are rounded off. Choose the closest to exact. There is no penalty for guessing.
- (6) **Hand in the answer sheet separately.**

$$g = 9.80 \text{ m/s}^2$$

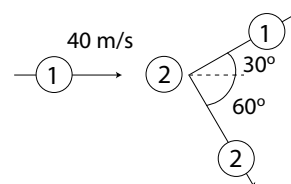
1. A rifle of mass 5 kg shoots a 0.05 kg bullet. The rifle's recoil is stopped by the rifleman's shoulder. His shoulder exerts a force of 200 N for 0.1 s on the rifle. What is the bullet's initial speed in m/s?

(1) 400                      (2) 600                      (3) 800                      (4) 1200                      (5) 1600

2. Autos A and B undergo a 1-dimensional elastic collision. The mass of A is twice that of B. Before the collision, A is moving in the positive x direction at 30 m/s, and B is moving in the positive direction at 10 m/s. After the collision, A is moving in the negative x direction at 10 m/s. What is the speed of B after the collision, in m/s?

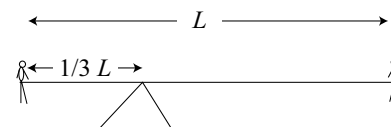
(1) 10                      (2) 5                      (3) 15                      (4) 20                      (5) not enough info

3. Autos 1 and 2 undergo a collision in 2 dimensions. Before the collision, Auto 2 is at rest, and auto 1 is moving along the x axis with speed 40 m/s. The mass of 1 is that twice that of 2. After the collision, the velocities of 1 and 2 make angles  $\theta_1 = 30^\circ$  and  $\theta_2 = 60^\circ$ , respectively, with respect to the x axis. What is the final speed of 2, in m/s?



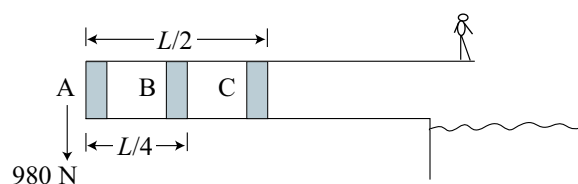
(1) 40                      (2) 30                      (3) 20                      (4) 50                      (5) 60

4. A uniform seesaw is supported by a fulcrum that is located at a point  $\frac{1}{3}$  of the length from one end. A child of mass 25 kg is sitting on one end. A second child of larger weight is sitting on the other end. What is the second child's mass, in kg?



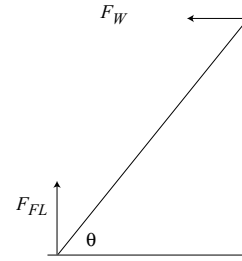
(1) 50                      (2) 10                      (3) 25                      (4) 35                      (5) 90

5. A diver of mass 100 kg stands at the end of a 100 kg uniform horizontal diving board of length  $L$ . The board has 3 vertical supports as shown. Support A exerts a force of magnitude 980 N in the downward direction on the board. What is the magnitude of the force exerted by support B on the board? Neglect the widths of the supports.



(1) 0                      (2) 50 N                      (3) 100 N                      (4) 200 N                      (5) 400 N

6. A uniform ladder leans against a wall in equilibrium. The wall's force  $F_W$  on the ladder is horizontal as shown. The value of the coefficient of static friction between the floor and the ladder is 0.75. The horizontal component of the force  $F_{FL}$  the floor on the ladder has a magnitude of 750 N. What is the magnitude of the wall's force on the ladder in N?



- (1) 750                      (2) not enough info                      (3) 250                      (4) 1000                      (5) 1250
7. An auto decelerates uniformly to rest in 10 s while traveling a distance of 100 m. The radius of the auto's wheels is 0.333 m. What is the initial angular velocity of the auto's wheels, in rad/s? Assume that the auto's wheels do not slip.
- (1) 60                      (2) 80                      (3) 100                      (4) 120                      (5) 140
8. A satellite is in a circular orbit around the Earth. Initially, the satellite is in an orbit of radius  $R_I$ , and its period is 2 hours. The satellite is then moved into another circular orbit so that its period is 1 day (24 hours). What is the radius  $R_F$  of the final orbit?
- (1)  $5.2R_I$                       (2)  $1.3R_I$                       (3)  $2.6R_I$                       (4)  $3.4R_I$                       (5)  $4.6R_I$