Instructor(s): *S. Obukhov*

PHYSICS DEPARTMENT

PHY 2004   Midterm Exam 2   February 24, 2016

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.
(4) **Blacken the circle of your intended answer completely, using a #2 pencil or <u>blue</u> or <u>black</u> 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. If you believe that no listed answer is correct, leave the form blank.**
(6) Hand in the answer sheet separately.

$$g = 9.81 \text{ m/s}^2 \qquad G = 6.67 \times 10^{-11} \text{N·m}^2/\text{kg}^2$$

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1. The pulley system shown in the figure is used to lift an object that weighs 60 N. The rope is continuous around each pulley. What is the tension T in the pulley rope?

   (1) 20 N
   (2) 30 N
   (3) 15 N
   (4) 60 N
   (5) 3 N
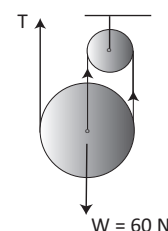
2. Joe is standing in a canoe that has a mass of 20 kg. The canoe is at rest on the surface of a smooth lake. Joe jumps off the canoe with a speed of 2 m/s. If Joe has a mass of 80 kg, what is the velocity of recoil of the canoe after he jumps?
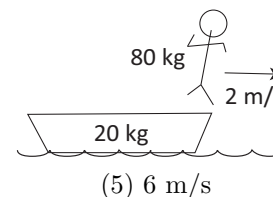
   (1) 8 m/s   (2) 20 m/s   (3) 0   (4) 5 m/s   (5) 6 m/s

3. A ping-pong ball of mass 2 gm and traveling with a velocity of 4 m/s collides with a stationary tennis ball of mass 10 gm. Calculate the velocity of the ping-pong ball after the collision, assuming the collision is elastic?

   (1) 2.7 m/s   (2) 4.6 m/s   (3) 2.0 m/s   (4) 0.67 m/s   (5) 3.9 m/s

4. A 50 kg block is sliding down a 30° incline with an initial velocity of 10 m/s. A force $F = 300$ N is applied to the block in the upward direction along the incline. The coefficient of kinetic friction $\mu_k = 0.7$. How far down the incline does the block travel before coming to rest?
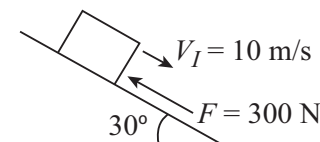
   (1) 7 m   (2) 3 m   (3) 1.5 m   (4) 17 m   (5) 21 m

5. A 20 kg block is accelerated across a horizontal floor from rest to 5 m/s in 3 s. The magnitude of the friction force acting on the block was 20 N. How much work is done by the external applied force that causes the block to accelerate?

   (1) 400 J   (2) 100 J   (3) 300 J   (4) 150 J   (5) 200 J

6. A hydraulic press has an input piston with a diameter of 0.375 cm and an output piston with a diameter of 4.0 cm. Calculate the force needed at the input piston to create an output force of 60,000 N.

(1) 526 N   (2) 13.2 N   (3) 66.1 N   (4) 6661 N   (5) 13,200 N

7. A 20 g bullet moving at 400 m/s strikes a tree and comes to rest after going 8 cm into the tree. Find the average force that stopped it.

(1) 20,000 N   (2) 2,500 N   (3) 300 N   (4) 7,000 N   (5) 50 N

8. A 700 kg car is waiting at a stop light, when a 1200-kg car coasting at 4.0 m/s strikes it from the rear. The cars do not stick together, nor is the collision perfectly elastic. The front car moves ahead at 5 m/s after the collision. What is the speed of the rear car after the collision?

(1) 1.1 m/s   (2) 2.2 m/s   (3) 0   (4) 0.5 m/s   (5) 2 m/s