Midterm Exam 02 (2018 Spring)

PHYS 203A: College Physics

Date: 2018 Mar 19

(Name) (Signature)

Instructions

1. Seating direction: Please be seated on seats with seat numbers divisible by 3.
2. Total time = 50 minutes.
3. There are 7 questions in this exam.
4. Equation sheet is provided separately.
5. To be considered for partial credit you need to show your work in detail and organize it clearly.
6. A simple calculator (with trigonometric functions) is allowed.
7. Use of mobile phones is strictly prohibited. It should stay out of reach during the exam.

1. (**10 points.**) A swimmer, capable of swimming at a speed of 1.0 m/s in still water (i.e., the swimmer can swim with a speed of 1.0 m/s relative to the water), starts to swim directly across a 2.0-km-wide river. However, the current is 0.40 m/s, and it carries the swimmer downstream. How far downstream will the swimmer be upon reaching the other side of the river?

2. (**10 points.**) The mass of Earth is 81 times larger than that of Moon. The radius of Earth is 3.6 times larger than that of Moon. Determine the acceleration due to gravity on the Moon.

3. (**10 points.**) Your mass is 75 kg. How much will you weigh on a weighing scale (designed to measure the normal force in Newtons) inside an elevator that is slowing down at $2.0\,\mathrm{m/s^2}$ while moving upward?

4. (**10 points.**) A student is skateboarding down a ramp that is 6.0 m long and inclined at 15° with respect to the horizontal. The initial speed of the skateboarder at the top of the ramp is 3.0 m/s. Neglect friction and find the speed at the bottom of the ramp.

5. (**10 points.**) A 50.0 kg crate rests on a level floor at a shipping dock. The coefficients of static and kinetic friction are 0.80 and 0.40, respectively.

   (a) List all the forces acting on the crate while a horizontal force is pushing it.

   (b) What horizontal pushing force is required to slide the crate across the dock at a constant velocity?

6. (**10 points.**) A street lamp weighs 150 N. It is supported by two separate wires. One wire makes an angle of 30.0° with the horizontal, and the other makes an angle of 20.0° with the horizontal. Determine the tensions in the two wires.

7. (**10 points.**) A car is safely negotiating an unbanked circular turn at a speed of 25 m/s. The road is dry, and the maximum static frictional force acts on the tires. Suddenly a long wet patch in the road decreases the maximum static frictional force to one-fourth of its dry-road value. If the car is to continue safely around the curve, to what speed must the driver slow the car?