Final Exam (2018 Fall)

PHYS 203A-002: College Physics

Date: 2018 Dec 13

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(Name)   (Signature)

Instructions

1. Seating direction: Please be seated on seats with seat numbers divisible by 3.

2. Total time = 120 minutes.

3. There are 10 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 golfer, putting on a green, requires three strokes to putt the ball into the hole. During the first putt, the ball rolls 4.0 m due West. For the second putt, the ball travels 2.0 m at an angle 30° South of West. The third putt is 1.00 m due South. What displacement (magnitude and direction relative to due West) would have been needed to put the ball into the hole on the very first putt?

2. (**10 points.**) After a ball is thrown vertically upward it travels a vertical height of $10.0\,\mathrm{m}$ before momentarily stopping at the highest point. Neglect air resistance. What is the speed at which it was thrown up?

3. (**10 points.**) As a tennis ball is struck, it departs from the racket horizontally with a speed of $25\,\mathrm{m/s}$. The ball hits the court at a horizontal distance of $20.0\,\mathrm{m}$ from the racket. How far above the court is the tennis ball when it leaves the racket?

4. (**10 points.**) Mass of Mars is 11 percent of that of Earth. Radius of Mars is 53 percent of that of Earth. Given that the acceleration due to gravity on Earth is $9.8\,\mathrm{m/s^2}$, then what can you conclude about the acceleration due to gravity on Mars.

5. (**10 points.**) Your mass is $55\,\mathrm{kg}$ (or $540\,\mathrm{Newtons}$). How much will you weigh on a weighing scale (designed to measure the normal force in Newtons) while standing on an incline making an angle of $30°$ with the horizontal.

6. (**10 points.**) A turntable is rotating with a constant angular speed of $6.0\,\mathrm{rad/s}$. You place a penny on the turntable. The coefficient of static friction between the penny and the turntable is 0.40.

   (a) List the forces acting on the penny.

   (b) Which force contributes to the centripetal acceleration of the penny?

   (c) What is the farthest distance away from the axis of rotation of the turntable that you can place a penny such that the penny does not slide away?

7. (**10 points.**) A person of mass 90.0 kg standing on a frictionless surface shoots an arrow of mass 20.0 g horizontally. If the arrow is shot at 60.0 m/s, determine the recoil speed of the person.

8. (**10 points.**) A mass of $20.0\,\text{kg}$ moving to the right at a velocity of $5.0\,\text{m/s}$ on a frictionless table, collides head-on with another stationary mass of $60.0\,\text{kg}$. They get entangled after collision (complete inelastic collision). How much kinetic energy is lost in the collision. That is, calculate the change in the kinetic energy of the system.

9. (**10 points.**) A particle is located at each corner of an imaginary square. Each side of the square is 1.0 m long, and each particle has a mass of 1.00 kg. What is the moment of inertia of these particles with respect to an axis that lies along one side of the square?

10. (**10 points.**) A cylinder ($I = \frac{1}{2}MR^2$) rolls perfectly (without sliding or slipping) on an inclined plane. If the cylinder started from rest at the top, vertical height of 1.00 m, what is the velocity of the cylinder when it reaches the bottom of the incline?