Physics 1A– 9 AM class
Quiz # 4   Nov. 30, 2007
Prof. Jose Onuchic

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

1) Alex throws a 0.15–kg rubber ball down onto the floor. The ball's speed just before impact is 6.5 m/s, and just after is 3.5 m/s. If the ball is in contact with the floor for 0.025 s, what is the magnitude of the average force applied by the floor on the ball?

   A) 3.5 N   B) 30 N   C) 3.0 N   D) 133 N   E) 60 N

2) Geosynchronous satellites orbit the Earth at a distance of 42 000 km from the Earth's center. Their angular velocity at this height is the same as the rotation of the Earth, so they appear stationary at certain locations in the sky. What is the force acting on a 1 500–kg satellite at this height?
   Hint: recall that force is related to centripetal acceleration

   A) 457 N   B) 85 N   C) 510 N   D) 333 N   E) 404 N

3) A 0.30–m–radius automobile tire accelerates from rest at a constant 2.0 rad/s^2. What is the centripetal acceleration of a point on the outer edge of the tire after 5.0 s?

   A) 30 m/s^2 B) 15 m/s^2 C) 3 m/s^2 D) 33 m/s^2 E) 300 m/s^2

4) 1. A 20–kg object sitting at rest is struck elastically in a head–on collision with a 10–kg object initially moving at +3.0 m/s. Find the final velocity of the 20–kg object after the collision.

   A) –1.0 m/s   B) +1.0 m/s   C) –2.0 m/s   D) +2.0 m/s   E) +1.5 m/s

Figure 1
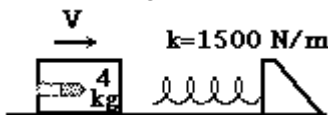
An 8 g bullet is shot into a 4.0 kg block, at rest on a frictionless horizontal surface. The bullet remains lodged in the block. The block moves into a spring and compresses it by 3.0 cm. The force constant of the spring is 1500 N/m.

5) In Figure 1, the initial velocity of the bullet is closest to:

   A) 310 m/s   B) 280 m/s   C) 290 m/s   D) 300 m/s   E) 320 m/s

6) A 20–g bullet moving at 1 000 m/s is fired through a one–kg block of wood emerging at a speed of 100 m/s. If the block had been originally at rest and is free to move, what is its resulting speed?

   A) 9 m/s   B) 18 m/s   C) 27 m/s   D) 90 m/s   E) 180 m/s

7) A 0.30–m–radius automobile tire rotates how many rad after starting from rest and accelerating at a constant 2.0 rad/s2 over a 5.0–s interval?

   A) 12.5 rad   B) 25 rad   C) 8.5 rad   D) 2.0 rad   E) 0.50 rad

8) A 90 kg halfback running north with a speed of 10 m/s is tackled by a 120 kg opponent running south at 4 m/s. The collision is perfectly inelastic. Compute the velocity of the two players just after the tackle.

    A) 3 m/s south   B) 2 m/s south   C) 2 m/s north   D) 3 m/s north   E) 14 m/s north

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) E
2) D
3) A
4) D
5) C
6) B
7) B
8) C