Exam 2–011

Q1 A 2.0-kg object moving along the x-axis has a velocity of 5.0 m/s at x = 2.0 m. If the only force acting on this object is shown in Fig.1, what is the speed of the object at x = 10 m?

A1: 5.0 m/s
A2: 0.0 m/s
A3: 3.1 m/s
A4: 8.5 m/s
A5: 2.1 m/s

Q2 An object is constrained by a cord to move in a circular path of radius 0.5 m on a horizontal frictionless surface. The cord will break if its tension exceeds 16 N. The maximum kinetic energy the object can have is:

A1: 4.0 J
A2: 8.0 J
A3: 16 J
A4: 32 J
A5: 2.0 J

Q3 A net horizontal force of 50 N acts on a 2-kg block which starts from rest on a horizontal frictionless surface. The rate at which the work is being done by this force at t = 2 s is:

A1: 2500 W
A2: 75 W
A3: 100 W
A4: 1000 W
A5: 5000 W

Q4 We would like to raise a heavy object (at a constant speed) to a certain height h. We attach a rope to the object. It is preferable to pull it along a frictionless inclined plane rather than pulling it vertically upward because:

A1: it reduces the force required
A2: it reduces the work required
A3: it reduces the change in the gravitational
A3: potential energy
A4: it reduces the distance covered
A5: it increases the acceleration due to gravity

Q5 A 2.0-kg block is dropped from a height of 0.10 m onto a spring of spring constant k (Fig. 2). The spring is compressed a maximum distance of 0.05 m (the block comes to rest momentarily). Find the value of k.

A1: 2350 N/m
A2: 1560 N/m
A3: 390 N/m
A4: 810 N/m
A5: 120 N/m

Q6 A single conservative force is acting on a 10-kg body. If the work done on the body by this force is 50 J, find the change in its potential energy.

A1: -50.0 J
A2: 50.0 J
A3: 98.0 J
A4: -10.0 J
A5: -1.00 J

Q7 A 2.0-kg particle is moving to the right at 9.0 m/s toward a 5.0-kg particle which is moving at 2.0 m/s in the opposite direction. Find the velocity of the center of mass.

A1: 1.1 m/s to the right
A2: 1.1 m/s to the left
A3: 5.5 m/s to the right
A4: 5.5 m/s to the left
A5: 0.0 m/s

Q8 A 1.0-kg object at rest explodes, breaking into three pieces of masses 0.20, 0.20, and 0.60 kg. The Two pieces, having equal mass, fly off perpendicular to each other, one along the positive x-axis and the other along the positive y-axis with the same speed of 30 m/s. Find the speed of the third (0.60-kg) piece.

A1: 14 m/s
A2: 10 m/s
A3: 20 m/s
A4: 30 m/s
A5: 17 m/s

Q9 What is the magnitude of the acceleration of the center of mass of the system shown in Fig. 3. Each particle has a mass of 1.00 kg and pulled by a force of 2.0 N in the direction indicated in Fig.3.

A1: 0.28 m/s**2
A2: 0.0 m/s**2
A3: 2.6 m/s**2
A4: 1.2 m/s**2
A5: 0.10 m/s**2

Q10 Two 2.0-kg bodies, A and B, collide. Before collision the velocity of body A is (10i + 20j) m/s and after the collision body A moves with velocity (-5.0i + 10j) m/s. Find the magnitude of the impulse delivered to body B.

A1: 36 kg.m/s
A2: 18 kg.m/s
A3: 0.0 kg.m/s
A4: 25 kg.m/s
A5: 11 kg.m/s

Q11 A 20-g bullet is fired into a 100-g wooden block initially at rest on a horizontal frictionless surface. If the initial speed of the bullet is 10 m/s and it comes out of the block with a speed of 5.0 m/s, find the speed of the block immediately after the collision.

A1: 1.0 m/s
A2: 3.2 m/s
A3: 5.3 m/s
A4: 0.3 m/s
A5: 0.0 m/s

Q12 A 1.0-kg block at rest on a horizontal frictionless surface is connected to a spring (k = 200 N/m) whose other end is fixed (Fig. 4). A 2.0-kg block moving at 4.0 m/s collides with the 1.0-kg block. If the two blocks stick together after the one-dimensional collision, what maximum compression of the spring does occur when the blocks momentarily stop?

A1: 0.33 m
A2: 0.23 m
A3: 0.43 m
A4: 0.13 m
A5: 0.54 m

Q13 A disk has a moment of inertia of 6.0 kg.m**2 and a constant angular acceleration of 2.0 rad/s**2 about its axis of rotation. If it starts from rest, find the work done by the net torque during the first 5.0 s.

A1: 300 J
A2: 30 J
A3: 60 J
A4: 600 J
A5: 0.0 J

Q14 A 10-kg block is attached to a cord that is wrapped around the rim of a flywheel of radius 0.5 m and hangs vertically (see Fig.5). If the moment of inertia of the flywheel is 2.0 kg.m**2, find the magnitude of the linear acceleration of the block.

A1: 5.4 m/s**2
A2: 9.8 m/s**2
A3: 0.0 m/s**2
A4: 2.0 m/s**2
A5: 3.5 m/s**2

Q15 A wheel starting from rest, turns through 8 revolutions in a time interval of 17 s. Assuming constant angular acceleration, the angular speed at the end of this time interval is:

A1: 5.9 rad/s
A2: 8.5 rad/s
A3: 0.0 rad/s
A4: 1.7 rad/s
A5: 3.5 rad/s

Q16 A disk has a mass of 32 kg and a radius of 25 cm.
It rolls without slipping along a level ground at
5.0 m/s. Find the total kinetic energy of the disk.

A1: 600 J
A2: 400 J
A3: 800 J
A4: 200 J
A5: 100 J

Q17 A 10.0-kg particle is moving in a horizontal circular path of radius 2.00 m with a constant angular speed of 10.0 rad/s. Find the magnitude of its angular momentum (in kg.m**2/s) about a vertical axis passing through the center of the circle.
A1: 400
A2: 40.0
A3: 0
A4: 50.0
A5: 500

Q18 A 2.0-kg block is located on the x-axis 3.0 m from the origin and is acted upon by a force F = 8.0i N. Find the net torque acting on the block relative to the origin.

A1: 0.0 k N.m
A2: -12 k N.m
A3: -24 k N.m
A4: 18 k N.m
A5: 24 k N.m

Q19 A hinged uniform beam (Fig. 6) weighs 400 N and 4.0 m in length carries a box of weight 294 N located at 3.0 m from the wall. A mass less string holds the right edge of the beam and makes an angle of 30 degrees with the vertical. What is the tension in the string?

A1: 486 N
A2: 882 N
A3: 1942 N
A4: 1682 N
A5: 600 N

Q20 A 300.0-kg mass is hanged from the end of a steel wire attached to the ceiling. The steel wire is 43.0 cm long, 2.00 mm in radius and has negligible mass. Calculate the change in the length of the wire (Young's modulus of the steel E = 2.00* 10**11 N/m**2).

A1: 0.50 mm
A2: 1.0 mm
A3: 2.0 mm
A4: 0.13 mm
A5: 0.32 mm

FIGURE 1

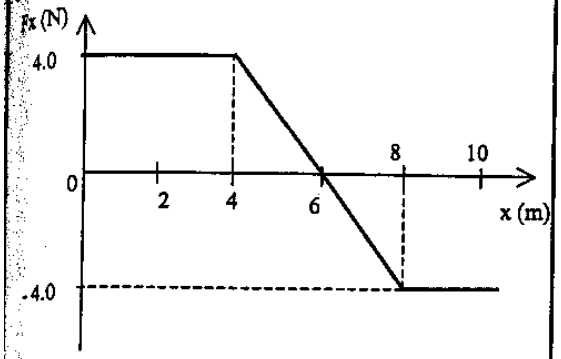


FIGURE 2

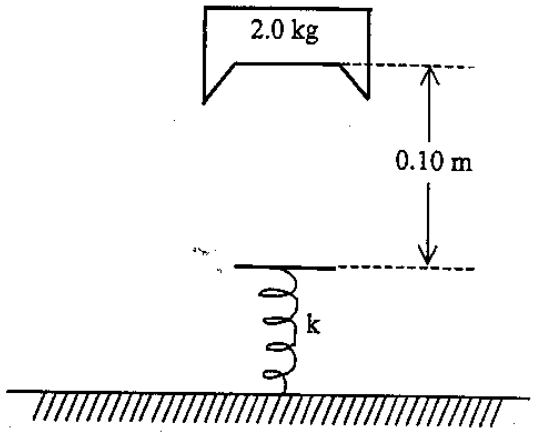
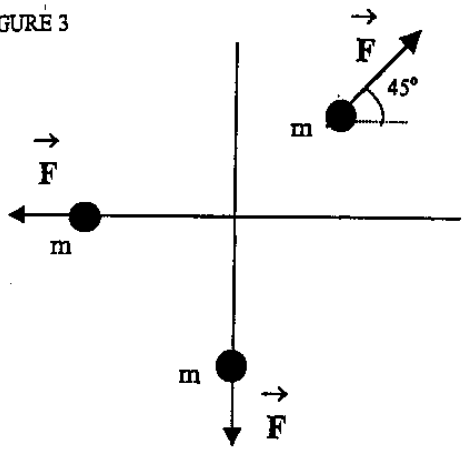


FIGURE 3



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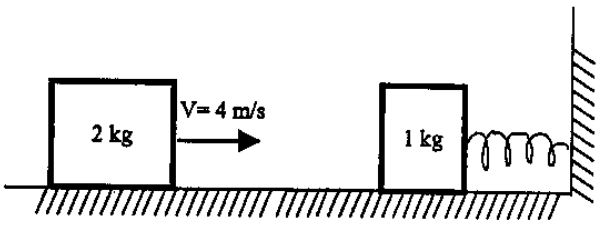

FIGURE 5

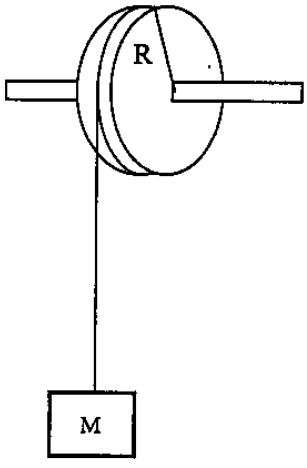
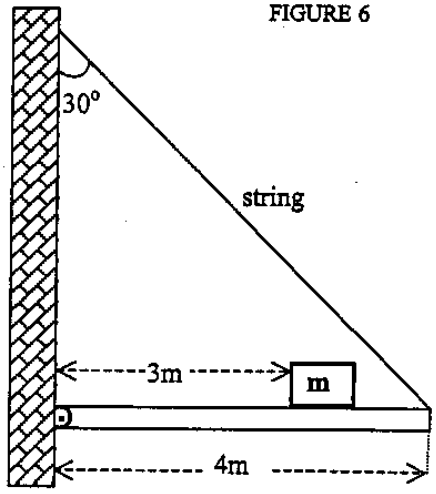
FIGURE 6