EXAM 2-022

Q1 A 5.0-kg object is pulled along a rough horizontal surface at constant speed by a 15 N force acting 30 degrees above the horizontal (see Fig.1). How much work is done by the friction force as the object moves 6.0 m?

A1: -78 J
A2: -82 J
A3: -85 J
A4: -75 J
A5: 0 J

Q2 A 2.0-kg block slides 2.0 m down a frictionless incline from point A to point B. A force (magnitude F =3.0 N) acts on the block between A and B, as shown in Fig.2. If the kinetic energy of the block at A is 10 J, what is its kinetic energy at B?

A1: 24 J
A2: 20 J
A3: 27 J
A4: 17 J
A5: 37 J

Q3 A 2.0-kg object moves along the +x-axis with a speed of 5 m/s under the influence of a force F= (3i+4j) N. What is the power delivered by this force?

A1: 15 W
A2: 20 W
A3: 25 W
A4: 35 W
A5: 30 W

Q4 A 12-kg block is resting on a horizontal frictionless surface. The block is attached to an unstretched spring (k= 800 N/m) (see Fig.3). A force F = 80 N parallel to the surface is applied to the block. What is the speed of the block when it is displaced by 13 cm from its initial position?

A1: 0.78 m/s
A2: 0.85 m/s
A3: 1.1 m/s
A4: 0.58 m/s
A5: 0.64 m/s

Q5 A block of mass m = 10 kg is connected to unstretched spring (k=400 N/m) (see Fig. 4). The block is released from rest. If the pulley is mass less and frictionless, what is the maximum extension of the spring?

A1: 49 cm
A2: 25 cm
A3: 33 cm
A4: 55 cm
A5: 11 cm

Q6 A 0.6-kg ball is suspended from the ceiling at the end of a 2.0-m string. As this ball swings, it has a speed of 4.0 m/s at the lowest point of its path. What maximum angle does the string make with the vertical as the ball swings?

A1: 54 degrees
A2: 61 degrees
A3: 69 degrees
A4: 77 degrees
A5: 47 degrees

Q7 When applied to a single object, a force is conservative if:

A1: its work done for motion in closed paths is equal to zero.
A2: its work done for motion in closed paths is greater than zero.
A3: it is parallel to the displacement always.
A4: it does equal work in equal displacement.
A5: its work done for motion in closed paths is less than zero.

Q8 Fig. 5 shows a uniform square sheet from which three identical corners are removed. What is the location of its center of mass?

A1: in the third quadrant.
A2: along the x-axis
A3: along the y-axis
A4: in the first quadrant.
A5: in the second quadrant.

Q9 Car A (mass 1000 kg) travels east with a constant velocity of 80 km/h. Car B(mass 1500 kg) has an unknown velocity. If the center of mass of these two cars is moving with a velocity of 24 km/h due north, find the velocity of car B. (Take i and j along east and north respectively).

A1: (-53i + 40j) km/h
A2: (30i + 40j) km/h
A3: (-40i + 18j) km/h
A4: (18i - 40j) km/h
A5: (35i + 35j) km/h

Q10 A 80-kg hunter gets a rope around a 120-kg polar bear. They are stationary, 10 m apart, on frictionless level ice. When the hunter pulls the polar bear to him, the polar bear will move:

A1: 4.0 m
A2: 6.0 m
A3: 5.0 m
A4: 8.0 m
A5: 2.0 m

Q11 Initially a 2-kg disk is moving north at 3 m/s on a horizontal smooth ice surface. Then a 4-N force in the east direction acts on the disk for 1.5 s. What is the final velocity of the disk?
(Take i and j along east and north respectively).

A1: (3i + 3j) m/s
A2: (3i + 4j) m/s
A3: 6(m/s) in the northeast direction.
A4: zero
A5: (5i) m/s

Q12 A 2.0-kg and a 3.0-kg carts approach each other on a horizontal air track in such a way that their center of mass has a speed of 2.0 m/s. They collide and stick together. After the collision their total kinetic energy in joules is:

A1: 10
A2: 4.0
A3: can't tell from the given data
A4: 6.0
A5: 5.0

Q13 Sphere A of mass 200 g is moving with VAi = +6.0 m/s. It makes a head-on collision with sphere B of mass 400 g at rest. After collision sphere B moves with VBf = +3.0 m/s. What is the velocity of sphere A after collision?

A1: 0 m/s
A2: -2.0 m/s
A3: 4.0 m/s
A4: 3.0 m/s
A5: 2.0 m/s

Q14 The angular speed in rad/s of the minute hand of a watch is:
11 Q0 (Note that PI = 3.14159...)

A1: PI/1800
A2: PI/60
A3: PI/3600
A4: 2*PI
A5: 60

Q15 A wheel of radius 0.10 m has a 2.5 m cord wrapped around its outside edge. Starting from rest, the wheel is given a constant angular acceleration of 2.0 rad/s**2. The cord will unwind in:

A1: 5.0 s
A2: 2.0 s
A3: 8.0 s
A4: 0.82 s
A5: 130 s

Q16 A disk starts from rest and rotates around a fixed axis, subject to a constant net torque. The work done by the torque from t=0 to t=3.0 s is W1 and the work one from t=0 s to t=6 s is W2.
The value of W1/W2 is:

A1: 1/4
A2: 2
A3: 1/2
A4: 1
A5: 4

Q17 Four identical particles, each with mass m, are arranged in the x, y plane as shown in Fig. 6. They are connected by massless rods to form a rigid body. If m =2.0 kg and a =1.0 m, the rotational inertia of this array about the y-axis is:

A1: 12 kg.m**2
A2: 4.0 kg.m**2
A3: 9.6 kg.m**2
A4: 4.8 kg.m**2
A5: 16 kg.m**2

Q18 A 2-kg particle moves in the xy plane with constant speed of 3.0 m/s in the +x-direction along the line y = 5 m (see Fig.7). What is its angular momentum (in kg.m**2/s) relative to the origin? (i, j, k are the unit vectors in x, y, z axes)

A1: -30 k
A2: +30 k
A3: -15 j
A4: +15 j
A5: -30 i

Q19 A solid sphere rolls without slipping along the floor. The ratio of its translational kinetic energy to its rotational kinetic energy (about an axis through its center of mass) is:

A1: 5/2
A2: 7/5
A3: 2/5
A4: 1/2
A5: 1/3

Q20 A man, with his arms at his sides, is spinning on a light frictionless turntable. When he extends his arms:

A1: his angular momentum remains the same
A2: his angular velocity remains the same
A3: his rotational inertia decreases
A4: his rotational kinetic energy increases
A5: his angular velocity increases

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FIGURE 1

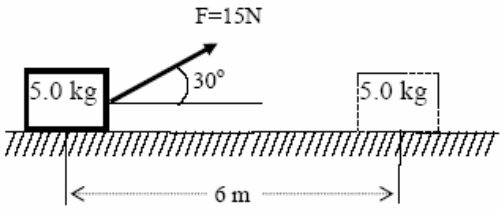

FIGURE 2

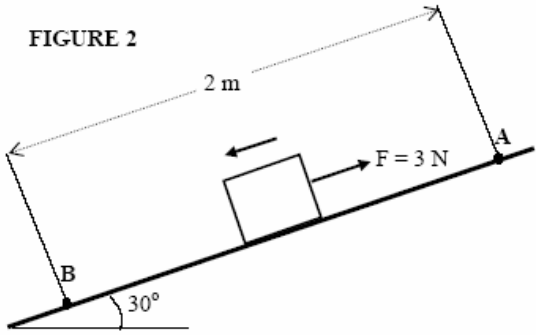

FIGURE 3

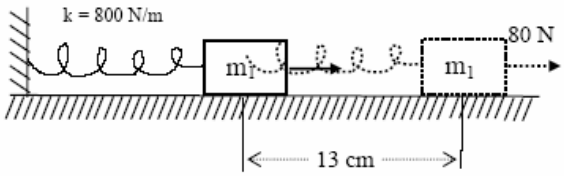

FIGURE 4

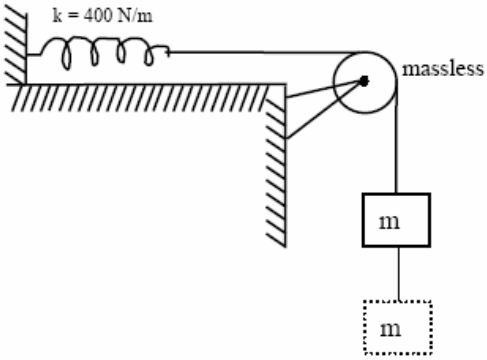

FIGURE 5

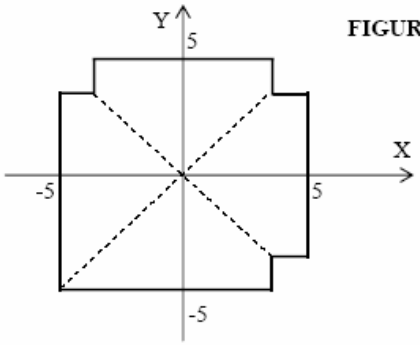

FIGURE 6

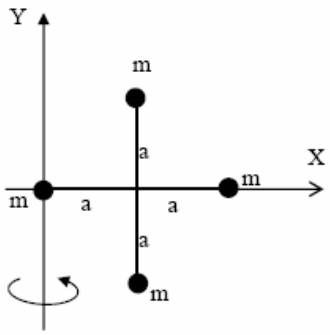

FIGURE 7