FINAL EXAM - 032

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Q1 Q0 During a short interval of time the velocity v (in m/s) of
   Q0 a car is given by v = b*t**3, where the time t is in
   Q0 seconds. The unit of  b is:
   Q0
   A1 m/s**4
   A2 s**4/m
   A3 m/s**3
   A4 m*s**4
   A5 s**3/m
   Q0
Q2 Q0 A ball is in free fall.  Its acceleration is:
   Q0 (ascent MEANS going up, descent MEANS going down)
   Q0
   A1 downward during both ascent and descent
   A2 downward during ascent and upward during descent
   A3 upward during ascent and downward during descent
   A4 upward during both ascent and descent
   A5 downward at all times except at the very top, where
   A5     it is zero
   Q0
Q3 Q0 Fig. 1 shows three vectors A,B and C. The magnitude of these
   Q0 vectors are 4.0 m, 6.0 m  and 4.0 m respectively. Find the
   Q0 magnitude of the vector D defined as: D = A + B + C
   Q0
   A1  10  m
   A2  4.0 m
   A3  13  m
   A4  8.5 m
   A5  14  m
   Q0
Q4 Q0 A particle is in uniform circular motion in the horizontal
   Q0 (x,y) plane whose origin is at the center of the circle.
   Q0 At a point, the instantaneous acceleration of the particle is
   Q0 a = (3 i + 3 j) m/s**2. At this instant, the particle is:
   Q0
   A1 in the third quadrant.
   A2 in the first quadrant.
   A3 in the second quadrant.
   A4 in the fourth quadrant.
   A5 on the x axis.
   Q0
Q5 Q0 A 13 N weight and a 12 N weight are connected by a massless
   Q0 string over a massless, frictionless pulley. The 13 N weight has
   Q0 a downward acceleration equal to:
   Q0 (Take: g = acceleration due to gravity)
   Q0
   A1 g/25
   A2 g/12
   A3 g/13
   A4 g
   A5 (13/25)g
   Q0
Q6 Q0 A 12 N horizontal force is trying to move a 40 N block initially
   Q0 at rest on a rough horizontal surface. The coefficients of
   Q0 static and kinetic friction between the block and the surface
   Q0 are 0.50 and 0.40, respectively. Find the frictional force on
   Q0 the block.
   Q0
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   A1 12  N
   A2 8.0 N
   A3 16  N
   A4 20  N
   A5 40  N
   Q0
Q7 Q0 A 5.0 kg cart is moving horizontally at 6.0 m/s. In order to
   Q0 change its speed to 10.0 m/s, the net work done on the cart must
   Q0 be:
   Q0
   A1 160 J
   A2 90  J
   A3 40  J
   A4 400 J
   A5 550 J
   Q0
Q8 Q0 A constant horizontal force of 10 N is applied to the free end
   Q0 of a horizontal ideal spring (with the other end fixed). The
   Q0 spring constant is 100 N/m. The elastic potential energy stored
   Q0 in the spring is:
   Q0
   A1 0.5 J
   A2 2.5 J
   A3 5.0 J
   A4 10  J
   A5 200 J
   Q0
Q9 Q0 A 6.0 kg block is released from rest 80 m above the ground. When
   Q0 it is 20 m above the ground its kinetic energy is:
   Q0
   A1 3500 J
   A2 4800 J
   A3 1200 J
   A4 120 J
   A5 60 J
   Q0
Q10Q0 A 80 kg man (at rest) standing on a frictionless surface throws
   Q0 a 100 g ball away from him along the positive x axis, giving it
   Q0 a speed of 8.0 m/s. What velocity does the man acquire as
   Q0 a result?
   Q0
   A1 0.01 m/s along (-x) direction
   A2 0.01 m/s along (+x) direction
   A3 0    m/s
   A4 8.0  m/s along (-x) direction
   A5 8.0  m/s along (+x) direction
   Q0
Q11Q0 A 140 gram ball is moving horizontally with a speed Vi of
   Q0 40.0 m/s before hitting a bat. After collision, the ball
   Q0 travels with a speed Vf = 40.0 m/s in the direction shown in
   Q0 Fig 2. What is the magnitude of the impulse that acts on the
   Q0 ball from the bat?
   Q0
   A1 10.8 kg.m/s
   A2 0    kg.m/s
   A3 13.2 kg.m/s
   A4 40.0 kg.m/s
   A5 5.60 kg.m/s
   Q0
```

Final Exam - 032 - Figures

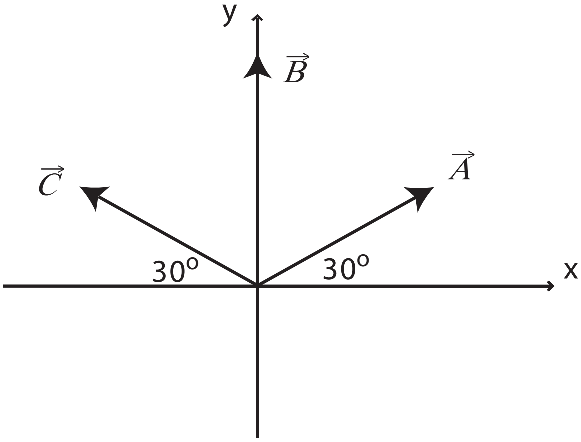

Figure 1

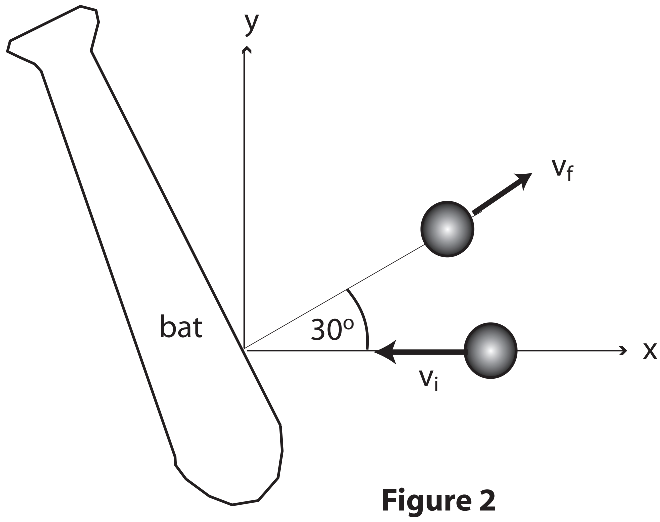

Figure 2

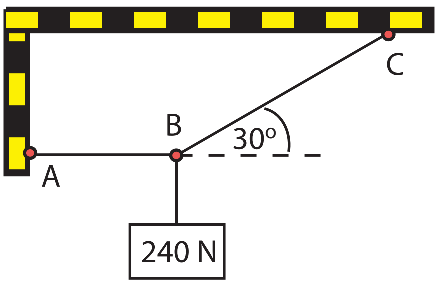

Figure 3

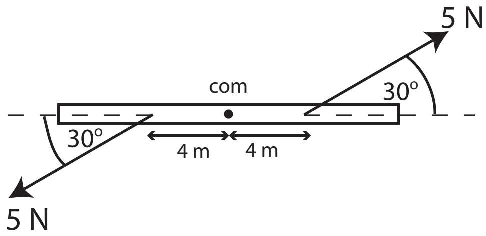

Figure 4

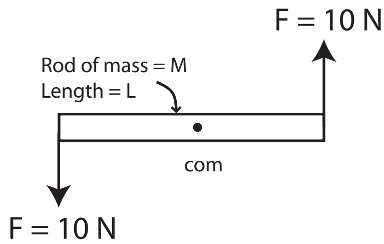

Figure 5

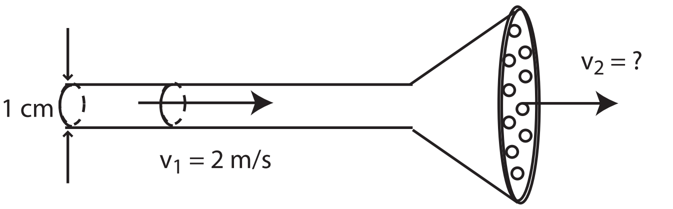

Figure 6

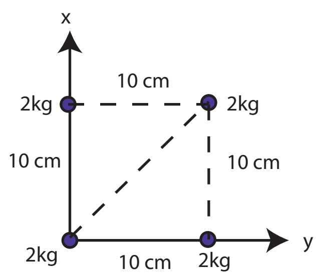

Figure 7

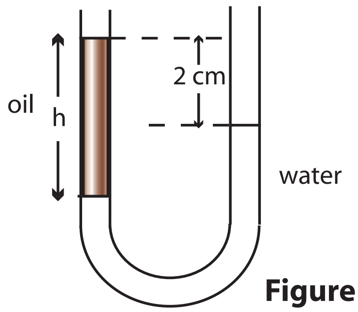

Figure 8

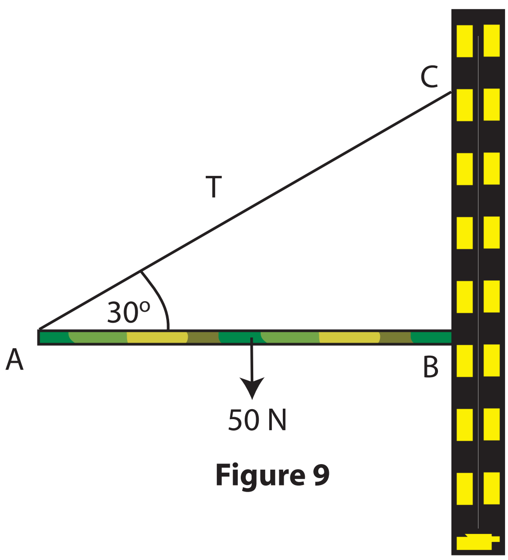

Figure 9

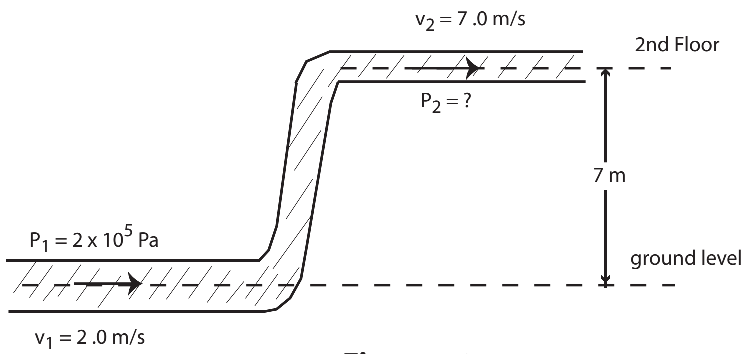

Figure 10

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Q12Q0 A 2.0 kg body (A) moves in the +x direction with a speed V. It
   Q0 makes an elastic head-on collision with another body (B)
   Q0 initially at rest. After collision, body (A) continues to move
   Q0 in the +x direction with a speed = V/4. Find the mass of body
   Q0 (B).
   Q0
   A1 1.2 kg
   A2 0.8 kg
   A3 8.0 kg
   A4 0.5 kg
   A5 2.0 kg
   Q0
Q13Q0 A rod is pivoted about its center. A 5.0 N force is applied
   Q0 4.0 m from the pivot and another 5.0 N force is applied 4.0 m
   Q0 from the pivot, as shown in Fig 4. The magnitude of the total
   Q0 torque about the pivot (in N*m) is:
   Q0
   A1 20
   A2 10
   A3 5.0
   A4 40
   A5 0
   Q0
Q14Q0 A 6.0 kg uniform solid cylinder is rolling without slipping on
   Q0 a horizontal surface. A horizontal force (F) is applied to the
   Q0 axle at its center of mass and gives the center of mass an
   Q0 acceleration of 4.0 m/s**2. Find the magnitude of the
   Q0 frictional force of the surface.
   Q0
   A1 12  N
   A2 6.0 N
   A3 9.0 N
   A4 0
   A5 24  N
   Q0
Q15Q0 A rod rests on a horizontal frictionless surface. Two forces
   Q0 that are equal in magnitude and opposite in direction are
   Q0 simultaneously applied to its ends as shown in Fig 5. Which of
   Q0 the following statements is CORRECT?
   Q0
   A1 The linear momentum of the c. m. of the rod is constant.
   A2 The angular acceleration of the rod = 0
   A3 The angular momentum of the rod about its c. m. = 0
   A4 The rotational kinetic energy of the rod about its c. m. = 0
   A5 The rotational inertia of the rod about its c. m. = 0
   Q0
Q16Q0 Fig 9 shows a stationary 50 N uniform rod (AB), 1.2 m long,
   Q0 held against a wall by a rope (AC) and friction between the rod
   Q0 and the wall. Find the force (T) exerted on the rod by the rope.
   Q0
   A1 50  N
   A2 25  N
   A3 100 N
   A4 87  N
   A5 29  N
   Q0
Q17Q0 A wire stretches 1.0 cm when a force F is applied to it. The
   Q0 same force is applied to a wire of the same material but with
   Q0 twice the diameter and twice the length. The second wire
   Q0 stretches:
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```
   Q0
   A1 0.50 cm
   A2 0.25 cm
   A3 1.0  cm
   A4 2.0  cm
   A5 4.0  cm
   Q0
Q18Q0 A 240 N weight is hung from two ropes AB and BC as shown in
   Q0 Fig 3. The tension in the horizontal rope AB is:
   Q0
   A1 416 N
   A2 0   N
   A3 656 N
   A4 480 N
   A5 176 N
   Q0
Q19Q0 Four equal masses, 2.0 kg each, are placed at the four corners
   Q0 of a square of side 10 cm as shown in Fig 7. What is the
   Q0 magnitude of the gravitational force on one of the masses due
   Q0 to the other three?
   Q0
   A1 5.1 * 10**-8 N
   A2   4.5 * 10**-8 N
   A3 3.7 * 10**-8 N
   A4 2.6 * 10**-8 N
   A5 2.5 * 10**-8 N
   Q0
Q20Q0 The escape speed from a certain planet for an empty spaceship
   Q0 of mass M is 2.0 * 10**4 m/s. What is the escape speed for
   Q0 a fully loaded spaceship which has mass = 3*M ?
   Q0
   A1 2.0 * 10**4  m/s
   A2 4.0 * 10**3  m/s
   A3 1.0 * 10**4  m/s
   A4 8.0 * 10**4  m/s
   A5 6.0 * 10**4  m/s
   Q0
Q21Q0 The gravitational acceleration at the surface of Earth =
   Q0 9.8 m/s**2. Find the gravitational acceleration at an altitude
   Q0 equal to 3 times the radius of earth.
   Q0
   A1 0.6 m/s**2
   A2 9.8 m/s**2
   A3  0  m/s**2
   A4 3.3 m/s**2
   A5 2.5 m/s**2
   Q0
Q22Q0 A 1200 kg satellite orbits the Earth (Mass = 5.98 * 10**24 kg
   Q0 and Radius R = 6.37 * 10**6 m) in an orbit of radius = 2*R.
   Q0 How much energy is needed to move the satellite from this
   Q0 orbit to another orbit of radius = 3*R?
   Q0
   A1 6.26*10**9  J
   A2 1.25*10**9  J
   A3 3.10*10**9  J
   A4 5.00*10**9  J
   A5 3.62*10**9  J
   Q0
Q23Q0 The density of oil is 0.8 g/cm**3. The height h of the column of
   Q0 oil as shown in Fig 8 is: (The density of water is 1.0 g/cm**3)
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```
   Q0
   A1 10  cm
   A2 4.6 cm
   A3 8.0 cm
   A4 12  cm
   A5 11  cm
   Q0
Q24Q0 An object hangs from a spring balance. The balance indicates
   Q0 30 N in air, 20 N when the object is completely submerged in
   Q0 water, and 24 N when the object is completely submerged in
   Q0 a liquid. The density of the liquid in g/cm**3 is:
   Q0
   A1 0.6
   A2 2.5
   A3 1.2
   A4 0.4
   A5 0.3
   Q0
Q25Q0 A sprinkler is made of a 1.0 cm diameter garden hose with
   Q0 one end closed and 25 holes, each with a diameter of 0.050 cm,
   Q0 cut near the closed end (see Fig 6). If water flows at 2.0 m/s
   Q0 in the hose, the speed of the water leaving a hole is:
   Q0
   A1 32  m/s
   A2 2.0 m/s
   A3 40  m/s
   A4 600 m/s
   A5 800 m/s
   Q0
Q26Q0 Fig 10 shows a water pipe enters a house and carries water to
   Q0 the second floor 7.0 m above ground. Water flows at 2.0 m/s in
   Q0 the ground level and at 7.0 m/s on the second floor. Take the
   Q0 density of water to be 1.0*10**3 kg/m**3. The pressure in the
   Q0 ground level is 2.0*10**5 Pa. Find the pressure on the second
   Q0 floor.
   Q0
   A1 1.1*10**5 Pa
   A2 5.3*10**4 Pa
   A3 1.5*10**5 Pa
   A4 2.5*10**5 Pa
   A5 3.4*10**5 Pa
   Q0
Q27Q0 In a simple harmonic motion, the magnitude of the acceleration
   Q0 is:
   Q0
   A1  proportional to the displacement
   A2  constant
   A3  inversely proportional to the displacement
   A4  greatest when the velocity is greatest
   A5  never greater than g
   Q0
Q28Q0 A 3.0 kg block, attached to a spring, executes simple harmonic
   Q0 motion according to x = 2*cos(50*t) where x is in meters and
   Q0 t is in seconds. The spring constant of the spring is:
   Q0
   A1 7500 N/m
   A2 100  N/m
   A3 150  N/m
   A4 1.0  N/m
   A5 50   N/m
```

```
   Q0
Q29Q0 A particle is in simple harmonic motion along the x axis. The
   Q0 amplitude of the motion is Xm. At one point in its motion its
   Q0 kinetic energy is K = 5 J and its potential energy is U = 3 J.
   Q0 When it is at X = Xm, the kinetic and potential energies are:
   Q0
   A1   K = 0 J and U =  8 J
   A2 K = 5 J and U =  0 J
   A3 K = 8 J and U =  0 J
   A4 K = 5 J and U =  3 J
   A5 K = 0 J and U = -8 J
   Q0
Q30Q0 The period of a simple pendulum is 1.0 s on Earth where the
   Q0 acceleration of gravity is g. When brought to a planet where
   Q0 the acceleration of gravity is g/16, its period becomes:
   Q0
   A1 4.0 s
   A2 2.0 s
   A3 0.5 s
   A4 1.4 s
   A5 1.0 s
```