Final Exam 021

Q1 Q0 A uniform rod AB is 1.5 m long and weighs 20 N. It is
ch Q0 suspended by wires AC and BD as shown in Fig. 1. A block P
13 Q0 weighing 80 N is attached at E, 0.50 m from A. The tension in
Q0 the wire BD is:
Q0
A1 37 N
A2 63 N
A3 100 N
A4 28 N
A5 72 N
Q0

Q2 Q0 A man weighing 720 N stands halfway up a 5.0 m ladder of
ch Q0 negligible weight. The base of the ladder is 3.0 m from the
13 Q0 wall as shown in Fig. 2. Assume that the wall-ladder contact
Q0 is frictionless. With what force does the wall push against
Q0 the ladder?
Q0
A1 270 N
A2 350 N
A3 500 N
A4 600 N
A5 720 N
Q0

Q3 Q0 A steel rod has a radius of 8.5 mm and a length of 100 cm.
ch Q0 A force of 6.0 x 10**4 N stretches it along its length. Take
13 Q0 Young's modulus for steel as 11 x 10**11 N/m**2. The increase
Q0 in the length of the rod in mm is:
Q0
A1 0.24
A2 0.36
A3 0.14
A4 0.71
A5 1.42
Q0

Q4 Q0 The diagrams in Fig. 6 show forces applied to a wheel of weight
ch Q0 W=20 N. Which diagram is the wheel in equilibrium?
13 Q0
A1 diagram (3)
A2 diagram (2)
A3 diagram (1)
A4 diagram (4)
A5 none of them
Q0

Q5 Q0 A satellite circles a planet every 2.8 h in an orbit of
ch Q0 radius 1.2 x 10**7 m. If the radius of the planet is
14 Q0 5.0 x 10**6 m, what is the mass of the planet?
Q0
A1 1.0 x 10**25 kg
A2 3.1 x 10**26 kg
A3 3.4 x 10**24 kg
A4 4.0 x 10**27 kg
A5 1.9 x 10**23 kg
Q0

Q6 Q0 Two stars of masses M and 6M are separated by a distance D.
ch Q0 Calculate the distance (measured from M) to a point at which
14 Q0 the net gravitational force on a third mass would be zero.
Q0
A1 0.29 D
A2 0.41 D

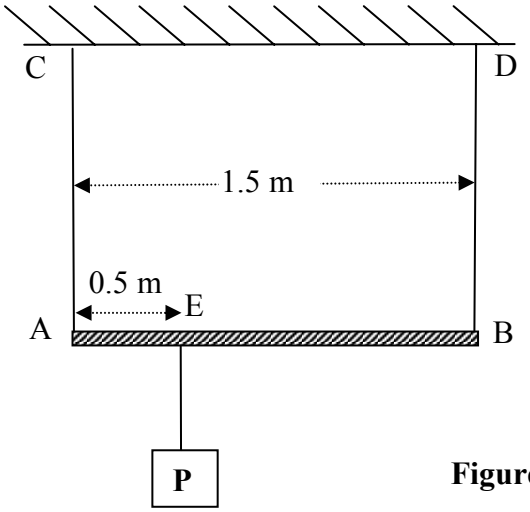


Figure-1

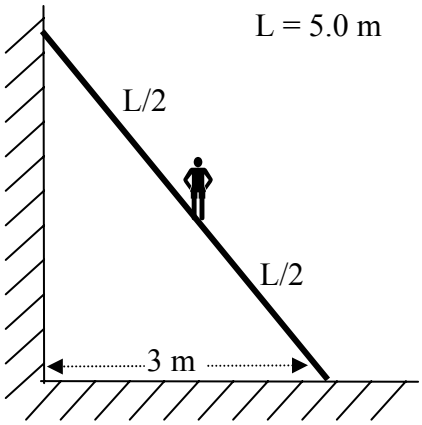


Figure-2

Figure-3

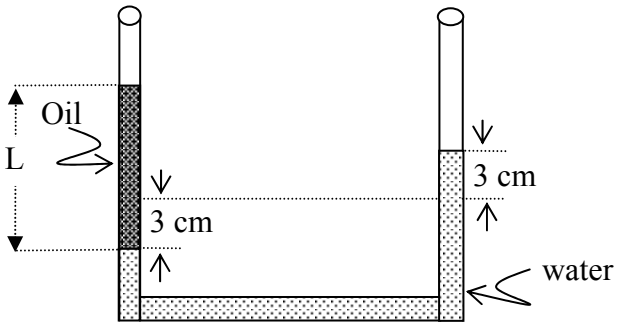
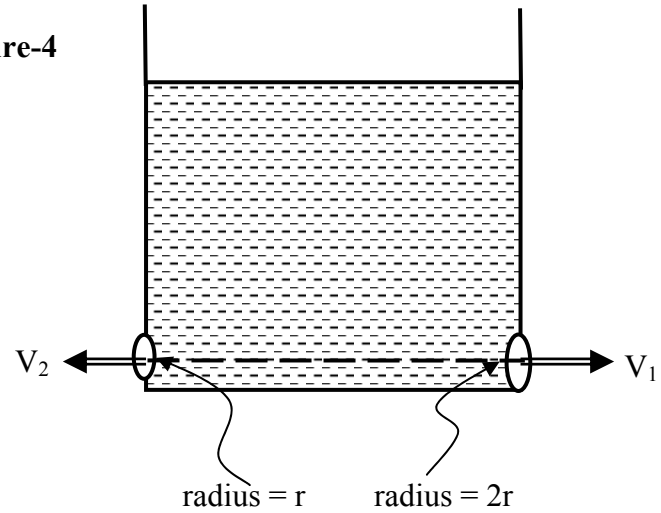


Figure-4



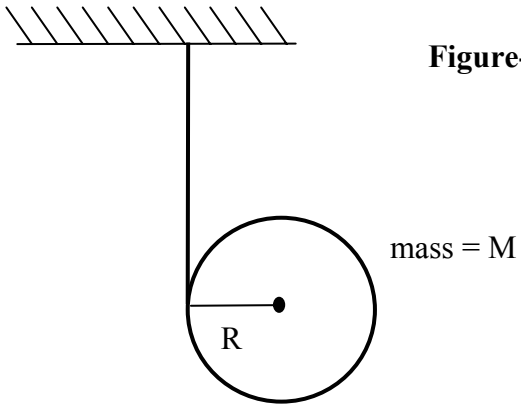


Figure-5

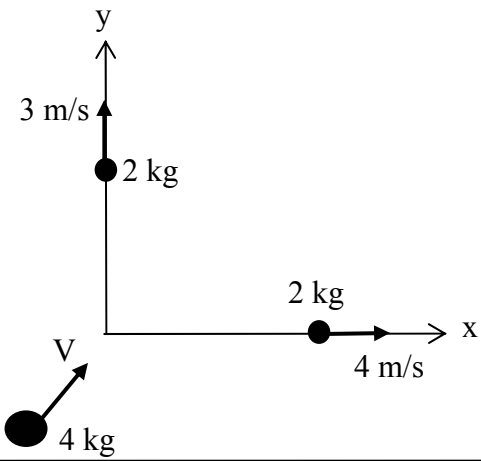


Figure-7

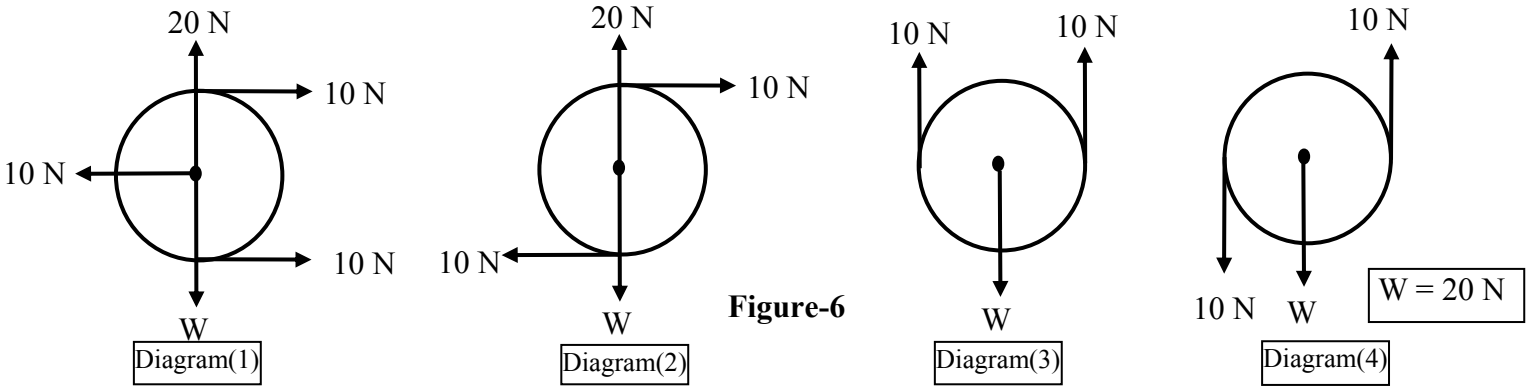


Figure-6

A3 0.33 D
A4 0.37 D
A5 0.14 D
Q0
Q7 Q0 A spaceship of mass m circles a planet (mass = M) in an orbit
ch Q0 of radius R. How much energy is required to transfer the
14 Q0 spaceship to a circular orbit of radius 3R?
Q0
A1 GmM/(3R)
A2 GmM/(6R)
A3 GmM/(2R)
A4 GmM/(4R)
A5 3GmM/(4R)
Q0
Q8 Q0 A planet has a mass of 5.0 x 10**23 kg and radius of
ch Q0 2.0 x 10**6 m. A rocket is fired vertically from the surface
14 Q0 of the planet with an initial speed of 4.0 km/s. What is the
Q0 speed of the rocket when it is 1.0 x 10**6 m from the surface
Q0 of the planet?
Q0
A1 2.2 km/s
A2 3.0 km/s
A3 1.6 km/s
A4 5.9 km/s
A5 3.7 km/s
Q0
Q9 Q0 A uniform U-tube is partially filled with water. Oil, of
ch Q0 density 0.75 g/cm**3, is poured into the left arm until the
15 Q0 water level in the right arm rises 3 cm (see Fig. 3). The
Q0 length of the oil column, L, is then:
Q0
A1 8 cm
A2 2 cm
A3 6 cm
A4 4 cm
A5 10 cm
Q0
Q10Q0 An object hangs from a spring balance. The balance indicates
ch Q0 30 N in air, 20 N when the object is completely submerged in
15 Q0 water, and 24 N when the object is completely submerged in an
Q0 unknown liquid. The density of the unknown liquid equals :
Q0
A1 0.6 g/cm**3
A2 2.5 g/cm**3
A3 1.2 g/cm**3
A4 0.4 g/cm**3
A5 0.3 g/cm**3
Q0
Q11Q0 A large open tank filled with water has two small holes in its
ch Q0 bottom, one with twice the radius of the other (see Fig. 4).
15 Q0 In steady flow, the speed of water leaving the larger hole is
Q0 v1 and the speed of the water leaving the smaller hole is v2.
Q0 Which of the following statements is correct?
Q0
A1 v1 = v2
A2 v1 = 2 v2
A3 v1 = v2 / 2
A4 v1 = v2 / 4
A5 v1 = 4 v2
Q0
Q12Q0 Water flows from a 6.0-cm diameter pipe into an 8.0-cm

ch Q0 diameter pipe. The speed in the 6.0-cm pipe is 5.0 m/s.
15 Q0 The speed in the 8-cm pipe is:
   Q0
   A1 2.8 m/s
   A2 3.7 m/s
   A3 6.6 m/s
   A4 8.8 m/s
   A5 9.9 m/s
   Q0
Q13Q0 The displacement of a particle moving with simple harmonic
ch Q0 motion is given by: x = 0.02 cos (300 t - pi/3) ,
16 Q0 where x is in m and t is in sec. What is the maximum speed of
   Q0 the particle?
   Q0
   A1 6   m/s
   A2 3   m/s
   A3 300   m/s
   A4 0.02 m/s
   A5 pi/3 m/s
   Q0
Q14Q0 A 0.65 kg block is fastened to a spring whose spring constant
ch Q0 is 65 N/m. The block is pulled a distance 20 cm from its
16 Q0 equilibrium position on a frictionless horizontal surface and
   Q0 released from rest. What is the angular frequency of the
   Q0 resulting motion?
   Q0
   A1 10   rad/s
   A2 20   rad/s
   A3 65   rad/s
   A4 0.65 rad/s
   A5 2.0   rad/s
   Q0
Q15Q0 A block-spring system is set in a simple harmonic motion.
ch Q0 The block has a kinetic energy of 6 J and an elastic potential
16 Q0 energy of 2 J when the displacement of the block is 2.0 cm
   Q0 from the equilibrium point. What is the amplitude of the
   Q0 simple harmonic motion?
   Q0
   A1 4 cm
   A2 2 cm
   A3 8 cm
   A4 10 cm
   A5 6 cm
   Q0
Q16Q0 A particle of mass m is acted upon by a force F. Which of the
ch Q0 following relationships between (F) and the displacement of
16 Q0 the particle (x) will result in simple harmonic motion?
   Q0
   A1 F = -5 x
   A2 F = -400 x**2
   A3 F = 10 x
   A4 F = 3 x**2
   A5 F = 5
   Q0
Q17Q0 What is the mass of air in a room that measures
ch Q0 5.0 m x 8.0 m x 3.0 m?
 1 Q0 (the density of air is 1.25 x 10**(-3) g/cm**3)
   Q0
   A1 150 kg
   A2 120 kg
   A3 100 kg

A4 200 kg
A5 50 kg
Q0
Q18Q0 A rock is thrown directly downward from the top of a building
ch Q0 with an initial speed of 10 m/s. It strikes the ground 3.0 s
2 Q0 later. What is the height of the building?
Q0
A1 74 m
A2 44 m
A3 30 m
A4 60 m
A5 14 m
Q0
Q19Q0 If A = (-10 i + 10 j) and B = (-10 i - 10 j), which statement
ch Q0 is CORRECT?
3 Q0
A1 (A-B) is perpendicular to (A+B)
A2 (A-B) is perpendicular to (B-A)
A3 The magnitude of (A-B) is larger than the magnitude of (A+B)
A4 The magnitude of (A-B) is smaller than the magnitude of (A+B)
A5 (A-B) is parallel to (A+B)
Q0
Q20Q0 A projectile is thrown from the origin with an initial velocity
ch Q0 Vo = (20 i + 98 j) m/s. If the projectile hits a target that
4 Q0 is a horizontal distance of 400 m away, what is the time of
Q0 flight of the projectile?
Q0
A1 20 s
A2 10 s
A3 25 s
A4 15 s
A5 30 s
Q0
Q21Q0 A block is released from rest on a 27 degree incline and
ch Q0 moves 6.0 m during the next 2.0 s. What is the coefficient
5 Q0 of kinetic friction between the block and the incline?
Q0
A1 0.17
A2 0.28
A3 0.22
A4 0.35
A5 0.12
Q0
Q22Q0 A 0.5 kg mass attached to the end of a string swings in
ch Q0 a vertical circle of radius = 2.0 m. When the mass is at its
6 Q0 lowest point on the circle, its speed is 12 m/s. What is the
Q0 magnitude of the tension of the string at this point?
Q0
A1 41 N
A2 31 N
A3 36 N
A4 46 N
A5 23 N
Q0
Q23Q0 A conservative force F = (-15 j) N acts on a particle as it
ch Q0 moves from the origin (0,0) to the point (3m,3m). How much work
7 Q0 is done by the given force during this displacement?
Q0
A1 -45 J
A2 +45 J
A3 -30 J

A4 +30 J
A5 +75 J
Q0
Q24Q0 A 4.0 kg block starts moving up a 30 degrees incline with an
ch Q0 initial kinetic energy of 300 J. How far will it slide up the
8 Q0 incline if the coefficient of kinetic friction between the
Q0 block and the incline is 0.3 ?
Q0
A1 10 m
A2 30 m
A3 20 m
A4 35 m
A5 15 m
Q0
Q25Q0 At what rate is the weight of a 2.0 kg projectile doing work at
ch Q0 an instant when the velocity of the projectile is 4.0 m/s
8 Q0 directed 30 degrees above the horizontal?
Q0
A1 -39 W
A2 +39 W
A3 -78 W
A4 +78 W
A5 +25 W
Q0
Q26Q0 A 4.0 kg object slides with speed v on a frictionless surface
ch Q0 explodes into two 2.0 kg parts, one moving at 3.0 m/s, due north,
9 Q0 and the other at 4.0 m/s, due east (Fig. 7). What is original
Q0 speed of the object (v)?
Q0
A1 2.5 m/s
A2 2.2 m/s
A3 5.0 m/s
A4 2.7 m/s
A5 3.1 m/s
Q0
Q27Q0 Body A of mass =M1 moves along the x axis with speed =v1i before
ch Q0 it has an elastic head-on collision with body B of mass = M2
10 Q0 which was at rest. After the collision, A has a velocity = v1f
Q0 and B has a velocity = v2f.
Q0 Which of the following statements is CORRECT?
Q0
A1 If M1 = M2, v1f = 0 and v2f = v1i.
A2 If M1 > M2, the direction of v1f is in the -x direction.
A3 If M2 > M1, the direction of v1f is in the +x direction.
A4 If M2 >> M1, v1f = 0.
A5 If M1 >> M2, v1f = 0.
Q0
Q28Q0 Starting from rest, a wheel rotating about a fixed axis with
ch Q0 a constant angular acceleration turns through 2.4 rev during the
11 Q0 first 2.0 s. What is the angular velocity at t = 2.0 s?
Q0
A1 15 rad/s
A2 12 rad/s
A3 18 rad/s
A4 10 rad/s
A5 24 rad/s
Q0
Q29Q0 A man, with his arms close to his body, is spinning on a light
ch Q0 frictionless turntable. When he extends his arms horizontally,
12 Q0
A1 his angular momentum remains the same

A2 his angular velocity increases
A3 his angular velocity remains the same
A4 his rotational inertia decreases
A5 his rotational kinetic energy increases
Q0
Q30Q0 A massless rope is wrapped around a uniform cylinder that has
ch Q0 radius R and mass M, as shown in Fig. 5. Initially, the
12 Q0 unwrapped part of the rope is vertical and the cylinder is
Q0 horizontal. The linear acceleration of the cylinder is:
Q0
A1 (2/3)g
A2 (1/2)g
A3 (1/3)g
A4 (1/4)g
A5 g