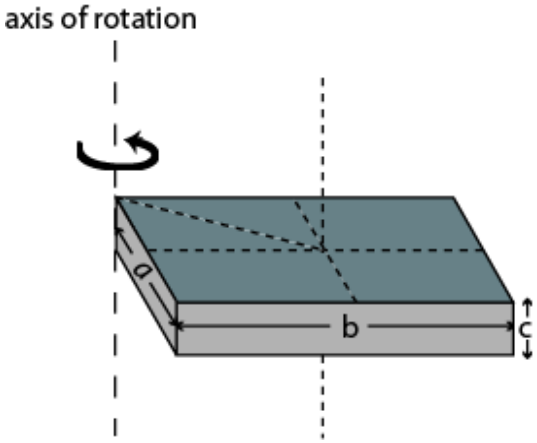
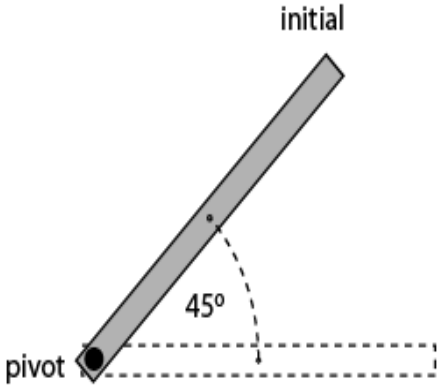
T072

Q13. Assume that a disk starts from rest and rotates with an angular acceleration of 2.00 rad/s^2. The time it takes to rotate through the first three revolutions is: (Ans: 4.34 s)

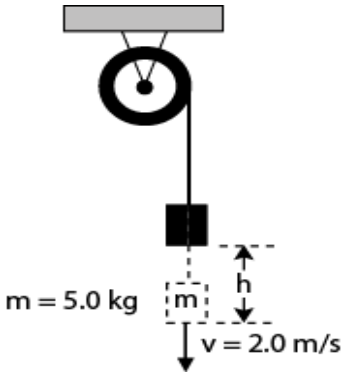
Q14. A uniform slab of dimensions: a = 60 cm, b = 80 cm, and c = 2.0 cm (see Fig. 6) has a mass of 6.0 kg. Its rotational inertia about an axis perpendicular to the larger face and passing through one corner of the slab is: (Ans: 2.0 kg.m^2)



Q15. A thin rod of mass 0.50 kg and length 2.0 m is pivoted at one end and can rotate in a vertical plane about this horizontal frictionless pivot (axis). It is released from rest when the rod makes an angle of 45° above the horizontal (Fig. 7). Find the angular speed of the rod as it passes through the horizontal position. (Ans: 3.2 rad/s)



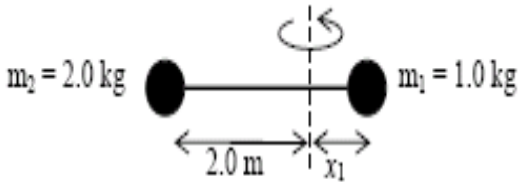
Q#16: A wheel of radius R = 0.20 m is mounted on a fixed frictionless horizontal axis. The rotational inertia I of the wheel about this axis is 0.50 kg.m^2. A massless cord wrapped around the circumference of the wheel is attached to a m = 5.0 kg box (Fig. 8). The box is then released from rest. When the box has a speed of v = 2.0 m/s, the distance (h) through which the box has fallen is:



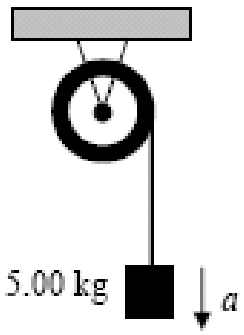
Q17. A force $\vec{F} = \left(2.0\,\hat{i} + 3.0\,\hat{j}\right)$ N is applied to an object that is pivoted about a fixed axis aligned along the z-axis. If the force is applied at the point of coordinates (4.0, 5.0, 0.0) m, what is the applied torque (in N.m) about the z axis? (Ans: $2.0\,\hat{k}$)

T071

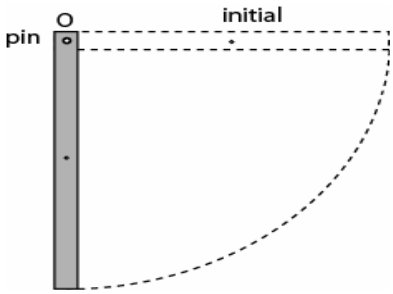
Q14. A rigid body consists of two particles attached to a rod of negligible mass. The rotational inertia of the system about the axis shown in Fig. 3 is 10 kg m^2. What is x_1? (Ans: 1.4 m)



Q15. A 5.00 kg block hangs from a cord which is wrapped around the rim of a frictionless pulley as shown in Fig. 4. What is the acceleration, a, of the block as it moves down? (The rotational inertia of the pulley is 0.200 kg·m^2 and its radius is 0.100 m.) (Ans: 1.96 m/s^2)



Q16. Fig. 5 shows a 1.0 m thin uniform rod of mass 2.0 kg, which is free to rotate about a frictionless pin passing through one end O. The rod is released from rest in the horizontal position. As the rod swings through its lowest position, its kinetic energy is: (Ans: 9.8 J)



T062:

Q13. : A torque of 0.80 N·m applied to a pulley increases its angular speed from 45.0 rev/min to 180 rev/min in 3.00 s. Find the moment of inertia of the pulley. (Ans: 0.17 kg·m^2)

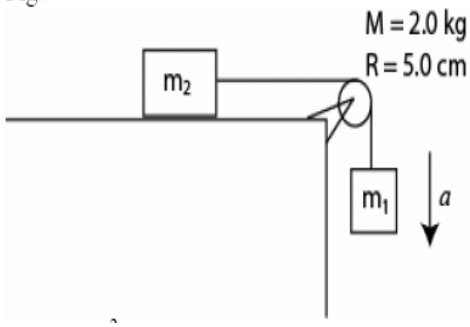
Q14. : A thin rod of mass 0.23 kg and length 1.00 m is rotated in a horizontal circle about a fixed axis passing through a point 20.0 cm from one of the edges of the rod. If it has a constant angular acceleration of 3.0 rad/s^2, find the net torque acting on the rod? (Ans: 0.12 N·m)

Q15. A disk starts from rest at t = 0, and rotates about a fixed axis (moment of inertia = 0.030 kg·m^2) with an angular acceleration of 7.5 rad/s^2. What is the rate at which work is being done on the disk when its angular velocity is 32 rad/s? (Ans: 7.2 W)

Q16: A disk has a rotational inertia of 4.0 kg·m^2 and a constant angular acceleration of 2.0 rad/s^2. If it starts from rest the work done during the first 5.0 s by the net torque acting on it is: (Ans: 200 J)

Q17. A mass, m_1 = 5.0 kg, hangs from a string and descends with an acceleration = a. The other end is attached to a mass m_2 = 4.0 kg which slides on a frictionless horizontal table. The string goes over a pulley (a uniform disk) of mass M = 2.0 kg and radius R = 5.0 cm (see Fig. 6). The value of a is: (Ans: 4.9 m/s^2)

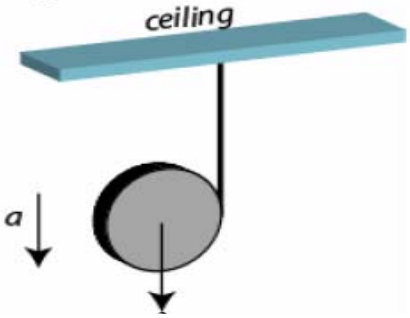
Fig#



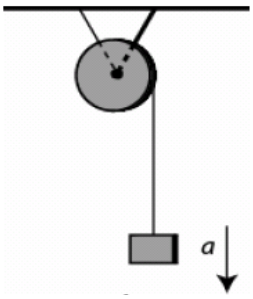
T061

Q13. : A string (one end attached to the ceiling) is wound around a uniform solid cylinder of mass *M* = 2.0 *kg* and radius *R* = 10 *cm* (see Fig 3). The cylinder starts falling from rest as the string unwinds. The linear acceleration of the cylinder is: (Ans: 6.5 *m/s*^{2})

Fig# 3

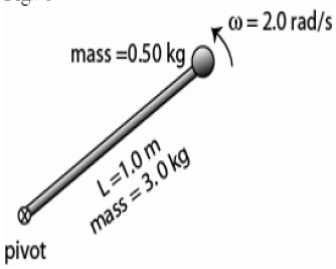


Q14. : A 16 *kg* block is attached to a cord that is wound around the rim of a flywheel of radius 0.20 *m* and hangs vertically, as shown in Fig 4. The rotational inertia of the flywheel is 0.50 *kg·m*^{2}. When the block is released and the cord unwinds, the acceleration of the block is: (Ans: 5.5 *m/s*^{2})



Q15. : A particle of mass 0.50 *kg* is attached to one end of a 1.0 *m* long rod of mass 3.0 *kg* (Fig 5). The rod and the particle are rotating around the other pivoted end of the rod with 2.0 *rad/s*. The kinetic energy of the system about the pivot is: (Ans: 3.0 *J)*

Fig# 5



Q16. A disk starts from rest and rotates around a fixed axis, subject to a constant net torque. The work done by the torque during the time interval from $t = 0$ to 2 *s* is W_1 and the work done during the time interval from $t = 0$ to 6 *s* is W_2. The ratioW_2/W_1 = (Ans: 9)

T052

Q13 The angular position of a particle is given as $\theta = 2 + t - t^3$ where θ is in *rad* and *t* is in *s*. The angular acceleration when the particle is momentarily at rest is (Ans: 3.5 rad/s^2 clockwise)

Q14 A disk of rotational inertia 5.0 kg m^2 starts rotating from rest and accelerates with a constant angular acceleration of 1.0 rad/s^2. During the first 4.0 s, the work done on the disk is: (Ans: 40 J)

Q15: The rotational inertia of a solid sphere (mass *M* and radius R_1) about an axis parallel to its central axis but at a distance of $2R_1$ from it is equal to I_1. The rotational inertia of a cylinder (same mass *M* but radius R_2) about its central axis is equal to I_2. If $I_1=I_2$, the radius of the cylinder R_2 must then be: (Ans: 3.0 R_1)

Q16: A rope pulls a 1.0-kg box on a frictionless surface through a pulley as shown in Fig 4. The pulley has a rotational inertia of 0.040 kg.m^2 and radius of 20 cm. If the force *F* is 10 N, then the acceleration of the box is: (Ans: 5.0 m/s^2)

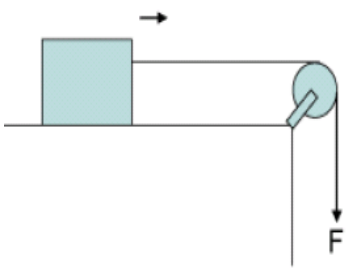


Figure 4

T051

Q13 A car engine is idling at ω_0= 500 rev/min at a traffic light. When the light turns green, the crankshaft rotation speeds up at a constant rate to ω= 2500 rev/min over an interval of 3.0 s. The number of revolutions the crankshaft makes during these 3.0 s is: (Ans: 75)

Q14 Find the moment of inertia of a uniform ring of radius R and mass M about an axis 2R from the center of the ring as shown in the Figure 3. (Ans: 5M R^2)

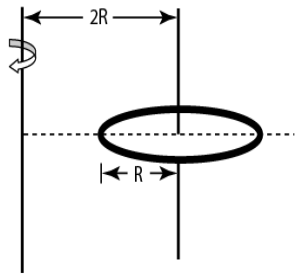


Figure 3

Q15 A uniform 2.0 kg cylinder of radius 0.15 m is suspended by two strings wrapped around it, as shown in Figure 4. The cylinder remains horizontal while descending. The acceleration of the center of mass of the cylinder is: (Ans: 6.5 m/s^2)

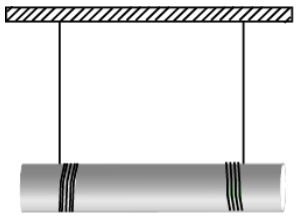


Figure 4

Q16. A uniform thin rod of mass M = 3.00 kg and length L = 2.00 m is pivoted at one end O and acted upon by a force F = 8.00 N at the other end as shown in Figure 5. The angular acceleration of the rod at the moment the rod is in the horizontal position as shown in this figure is: (Ans: 3.35 rad/s^2 clockwise)

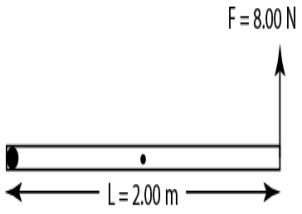


Figure 5

Q19. Force F = (-8.0 N) *i*+ (6.0 N) *j* acts on a particle with position vector **r** = (3.0 m) *i*+ (4.0 m)*j*. What is the torque on the particle about the point P = (0, 4.0 m)? (Ans: 18*k* N.m)

T042

Q14: A wheel initially has an angular velocity of 18 rad/s but it is slowing at a constant rate of 2.0 rad/s^2. The time it takes to stop is (Ans: 9.0 s)

Q15: Two wheels A and B are identical. Wheel B is rotating with twice the angular velocity of wheel A. The ratio of the radial acceleration of a point on the rim of B (a_2) to the radial acceleration of a point on the rim of A (a1) is a2/a1 : (Ans: 4)

Q16: Four identical particles, each with mass m, are arranged in the x, y plane as shown in Fig 5. They are connected by light sticks of negligible mass to form a rigid body. If m = 2.0 kg and a = 1.0 m, the rotational inertia of this system about the y-axis is:
(Ans: 12 kg.m^2)

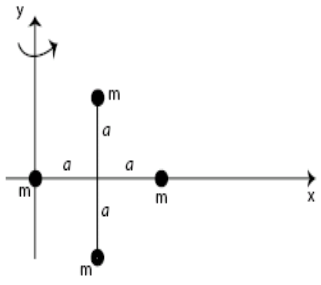


Figure 5

Q17: Fig 6 shows a pulley (R=3.0 cm and I_o= 0.0045 kg.m^2) suspended from the ceiling. A rope passes over it with a 2.0 kg block attached to one end and a 4.0 kg block

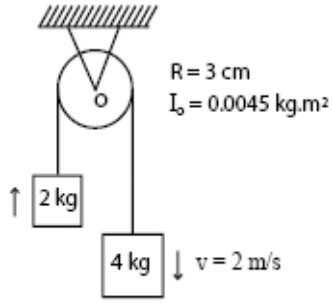


Figure 6

attached to the other. When the speed of the heavier block is 2.0 m/s the total kinetic energy of the pulley and blocks is : (Ans: 22 J)

T041

Q14: A uniform rod (M = 2.0 kg, L = 2.0 m) is held vertical about a pivot at point P, a distance L/4 from one end (see Fig 7). The rotational inertia of the rod about P is 1.17 kg.m^2. If it starts rotating from rest, what is the linear speed of the lowest point of the rod as it passes again through the vertical position (v)? (Ans: 8.7 m/s).

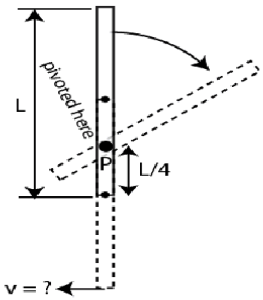


Figure 7

Q16 At t=0, a disk has an angular velocity of 360 rev/min, and constant angular acceleration of -0.50 rad/s^2. How many rotations does the disk make before coming to rest? (Ans: 226)

Q17 In Fig 6, m_1 = 0.50 kg, m_2 = 0.40 kg and the pulley has a disk shape of radius 0.05 m and mass M = 1.5 kg. What is the linear acceleration of the block of mass m2? (Ans: 0.59 m/s^2)

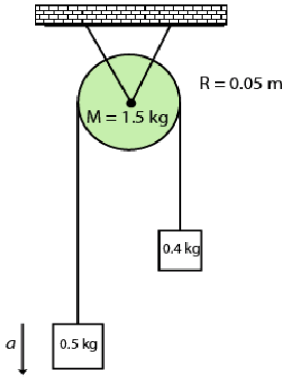


Figure 6