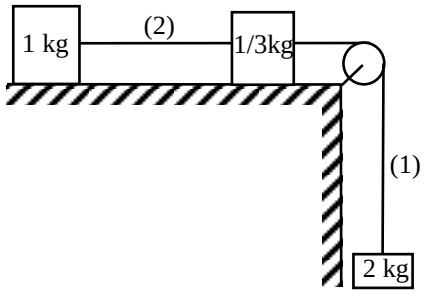
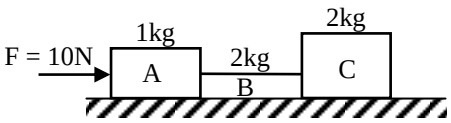
ASSIGNMENT-2

NUMERICAL QUESTIONS:

Q.1 Find the tension in string 1. All the surfaces are frictionless. Strings are light and frictionless. (take g = 10 m/s^2)

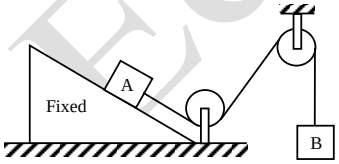


Q.2 Find the magnitude of the force exerted by A on B.



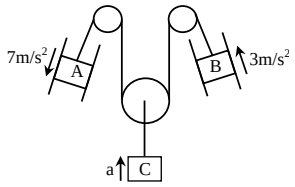
All surfaces are frictionless.

Q.3 Two blocks A and B of equal mass m are connected through a massless string and arranged as shown in figure. Friction is absent everywhere. When the system is released from rest, then find the tension in string. Where m is 2 kg.
(g = 10m/s^2)



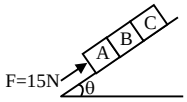
Draw FBD, apply Newton's 2nd law of motion.

Q.4 Assuming all the surfaces to be frictionless, find the acceleration of the block C shown in figure.

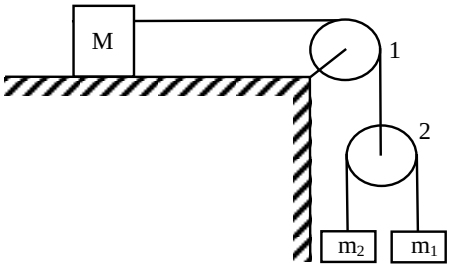


Q.5 A light string fixed at one end to a clamp on ground passes over a fixed pulley and hangs at the other side. It makes an angle of 30º with the ground. A monkey of mass 5 kg climbs up the rope. The clamp can tolerate a vertical force of 40N only. Find the maximum acceleration in upward direction with which the monkey can climb safely is (Neglect friction and take g = 10 m/s^2)

Q.6 Three blocks are placed at rest on a smooth inclined plane with force acting on block A parallel to the inclined plane. Find the contact force between block B and C.

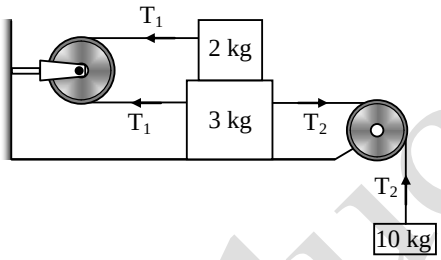


Q.7 In the arrangement shown in figure $m_1 = 0.9$ kg, $m_2 = 2$kg. Pulleys are massless and strings are light. Fine the tension in the string attached to m_1 when m_1 moves with constant velocity ?

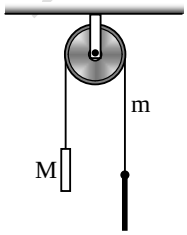


(Neglect friction) ($g = 10m/s^2$)

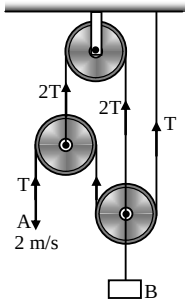
Q.8 Coefficient of kinetic friction between 3 kg and 2 kg block is 0.3. The horizontal table surface is smooth. Find the acceleration of block of mass
10 kg. [in ms^{-2}]



Q.9 In the arrangement shown in figure, the mass of the rod M = 2 kg exceeds the mass m = 0.5 kg of the ball. The mass has an opening permitting it to slide along the thread with some friction. The mass of the pulley and the friction in its axle are negligible. At the initial moment ball was located opposite to the lower end of the rod. When set free, both bodies began moving with constant accelerations. Find the friction force between the ball and the thread if t = 2 second after the beginning of motion the ball got opposite the upper end of the rod. The rod length equals ? = 0.3 m. [in 10^{-1}]

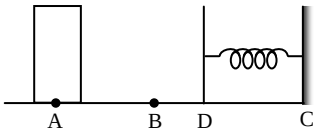


Q.10 If end of the cord A is pulled down with 2 m/s, then calculate the velocity of block. [in 10^{-1} ms^{-1}]

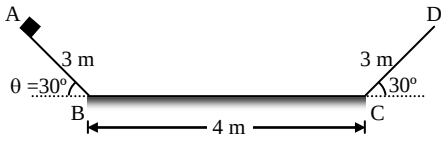


Q.11 A 0.5 kg block slides from point A as shown in figure, on a horizontal track with an initial speed of 3 ms^{-1} towards a massless horizontal spring of length 1 m and force constant 2 Nm^{-1}. Part AB of the track is frictionless and part BC has the coefficients of static and kinetic friction of 0.22 and 0.2 respectively. If the distances AB

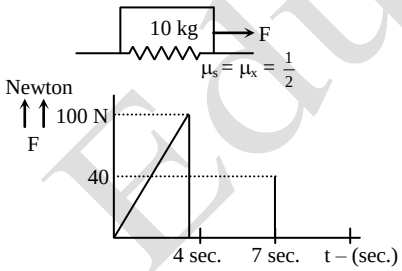
and BD are 2 m and 2.14 m respectively, find the total distance through which the block moves before it comes to rest completely. Take g = 10 ms^{-2}.



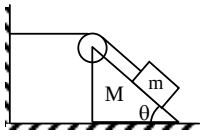
Q.12 A track has two inclined surfaces AB and AC each of length 3 m and angle of inclination of 30º with the horizontal and a central horizontal part of length 4 m as shown in figure. A block of mass 0.2 kg slides from the rest from point A. The inclined surfaces are frictionless. If the coefficient of friction between the block and the horizontal flat surface is 0.2, where will the block finally come to rest from point B? [in 10^{-1} m]



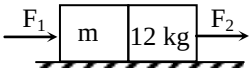
Q.13 The 10 kg block is resting on the horizontal surface. When the F is applied to it for 7 sec what is the maximum velocity gained by the block-



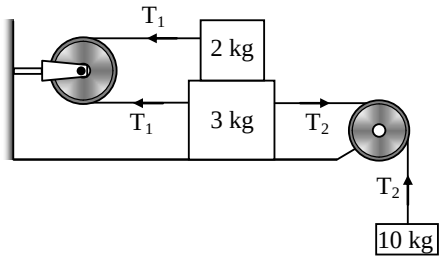
Q.14 Find the value of the horizontal force F in Newton that must be applied on the smooth wedge of mass M to keep it at rest. All surfaces are smooth and pulley and string are ideal. (Given : g = 10 m/s^2)
(Use – M = 10 kg , m = 0.5 kg, □ = 37º)



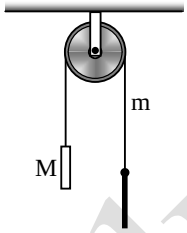
Q.15 Two blocks of m and 12 kg are placed side by side on a smooth horizontal surface as shown. Two horizontal forces F_1 = 18 N and F_2 = 36 N are applied. Then find the value of m in kg if m does not exerts any force on 12 kg.



Q.16 Coefficient of kinetic friction between 3 kg and 2 kg block is 0.25. The horizontal table surface is smooth. Find the acceleration of block of mass 10 kg. [Ans. in ms^{-2}]

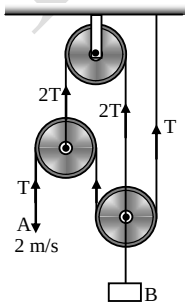


Q.17 In the arrangement shown in figure, the mass of the rod M = 2 kg exceeds the mass m = 0.5 kg of the ball. The mass has an opening permitting it to slide along the thread with some friction. The mass of the pulley and the friction in its axle are negligible. At the initial moment ball was located opposite to the lower end of the rod. When set free, both bodies began moving with constant accelerations. Find the friction force between the ball and the thread if t = 2 second after the beginning of motion the ball got opposite the upper end of the rod. The rod length equals □ = 0.3 m. [Ans. in.....× 10^{-1}]

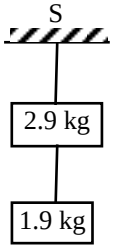


Q.18 A particle of mass 10^{-2} kg is moving along the positive x-axis under the influence of a force $F(x) = -K/(2x^2)$ where $K = 10^{-2}$ Nm^2. At time t = 0 it is at x = 1.0 m and its velocity is v = 0. Find its velocity when it reaches x = 0.50 m.

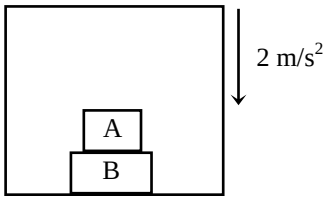
Q.19 If end of the cord A is pulled down with 2 m/s, then calculate the velocity of block. [in $10^{-1}ms^{-1}$]



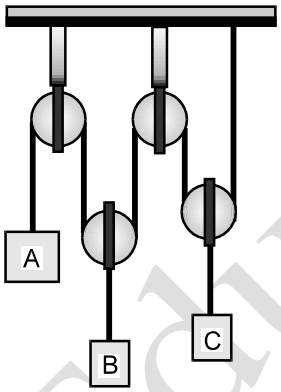
Q.20 Two blocks of mass 2.9 kg and 1.9 kg are suspended from a rigid support S by two inextensible wires each of length 1 meter see figure. The upper wire has negligible mass and the lower wire has a uniform mass of 0.2 kg/m. The whole system of block wires and support have an upwards acceleration of 0.2 m/s^2. Acceleration due to gravity is 9.8 m/s^2. If the tension at the mid-point of the lower wire is T then T/10 is equal to .....



Q.21 The elevator shown in figure is descending with an acceleration of 8 m/s^2. The mass of the block A is 0.5 kg. What force is exerted by the block B on surface of elevator ? The mass of block B is 1.5 kg.(take g = 10 m/s^2)

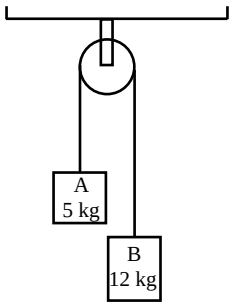


Q.22 If block A of the pulley system is moving downward with a speed of 2 m/s while block C is moving up at 0.5 m/s, determine the speed of block B.

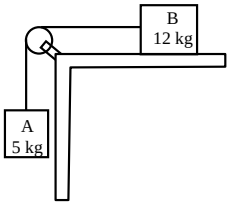


Q.23 Two blocks of mass 1 kg & 2 kg are hanged from a light pulley and resting on a horizontal surface. A time varying force F = 4t N is acting on pulley in the direction shown. Time after which block will break off the surface will be –

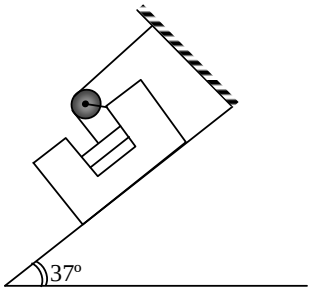
Q.24 Figure shows the same two blocks, A and B from figure but now suspended by a string on either side of a frictionless pulley. Find the accelerations of the two block.



Q.25 Figure shows a 5-kg block A which hangs from a string which passes over a frictionless pulley and is joined at its other end to a 12-kg block B which lies on a frictionless table. Find the acceleration of the two blocks.

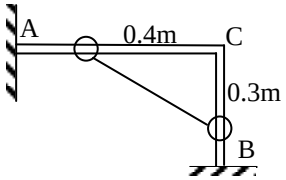


Q.26 A block B is kept on an inclined plane. Another block A is inserted in a slot in the block B through a light string. One end of the string is fixed to a support and other end of the string is attached to A. All the surfaces are smooth. Masses of A and B are same. The acceleration of block B is found to be 4/n. Find value of n.

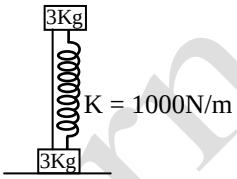


Q.27 Two identical beads of m = 100 gram are connected by an inextensible massless string which can slide along the two arms AC and BC of a rigid smooth wire frame in a vertical plane. If the system is released from rest, the kinetic energy of the first particle when they have moved by a distance of 0.1 m is $8x \times 10^{-3}$J. Find the value of x. ($g = 10\ m/s^2$)

(shown situation is after movement of 0.1 m)



Q.28 A system consists of two identical cubes, each of mass 3 kg linked together by a compressed weightless spring of force constant 1000 N/m. The cubes are also connected by a thread which is bent at a certain moment. At what minimum value of initial compression x_0 (in cm) the spring will the lower cube bounce up after the thread is burst the through ?



Q.29 A uniform chain of length L has one of its end attached to the wall at point A, while $\frac{3L}{4}$ of the length of the chain is lying on table as shown in figure. The minimum coefficient of friction between table and chain so that chain remains in equilibrium is $\frac{n}{4}$. Find the value of n.