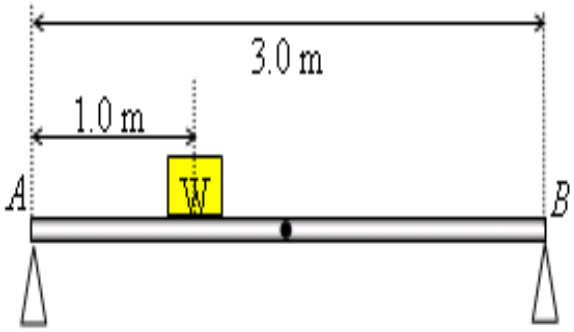
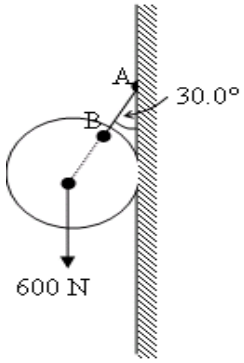
Old Exam. Questions- Ch. 12

T072

Q16. A uniform steel bar of length 3.0 m and weight 20 N rests on two supports (*A* and *B*) at its ends. A block of weight W = 30 N is placed at a distance 1.0 m from *A* (see Fig. 4). The forces on the supports A and B respectively are: (Ans:30 N and 20 N)



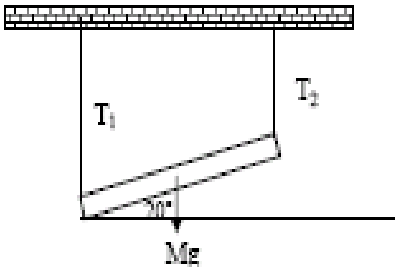
Q17. Fig. 5 shows a uniform ball of 600 N weight suspended by a string AB and rests against a frictionless vertical wall. The string makes an angle of 30.0° with the wall. The magnitude of the tension in the string is: (Ans: 693 N)



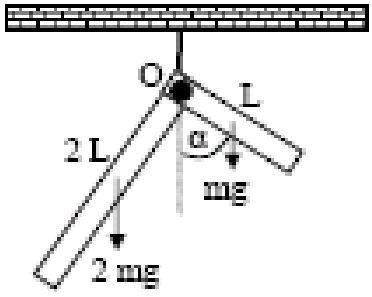
Q18. A horizontal steel rod of length 81 cm and radius 9.5 mm is fixed at one end. It stretches by 0.90 mm when a horizontal force of magnitude F is applied to its free end. Find the magnitude of F (Young modulus of steel is 20×10^{10} N/m^2). (Ans: 63 kN)

T071

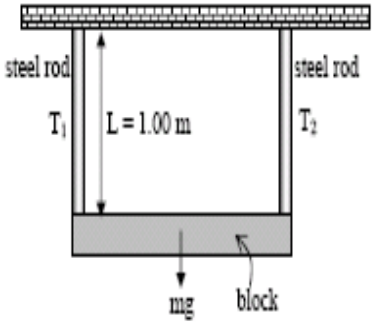
Q1. A uniform meter stick has mass M = 1.25 kg. As shown in Fig. 1, this meter stick is supported by two vertical strings, one at each end, in such a manner that it makes an angle of 20° with the horizontal. Find the tension in each string.(Ans: T1 = 6.1 N, T2 = 6.1 N)



Q2. A thin right angled rod is made of a uniform material. The shorter end is half the length of the longer end. It is hanging by a string attached at point O (Fig. 2). At equilibrium, the angle α between the shorter rod and the vertical is: (Ans: 76°)

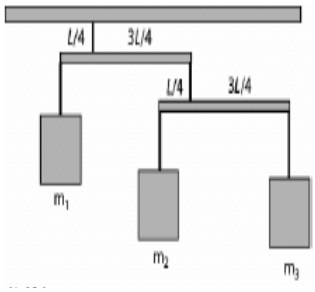


Q3. Fig. 3 shows a uniform block of mass m = 100 kg, which is held in a horizontal position by two vertical steel rods at its ends. Each of the rods has length, L = 1.0 m, cross sectional area = 1.0×10^{-3} m^2 and Young's modulus, $E = 2.0 \times 10^{11}$ N/m^2 . The increase in the length of any one the rods (ΔL), is: (Ans: 2.5×10^{-6} m)

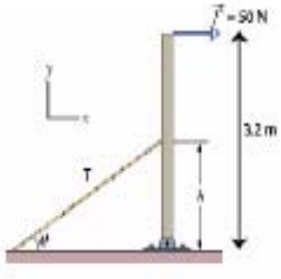


T062

Q1. Fig. 1 shows a three boxes of masses m_1, m_2 and m_3 hanging from a ceiling. The crossbars are horizontal and have negligible mass and same length L. If m_3 = 1.0 kg, then m_1 is equal to:(Ans: 12 *kg*)



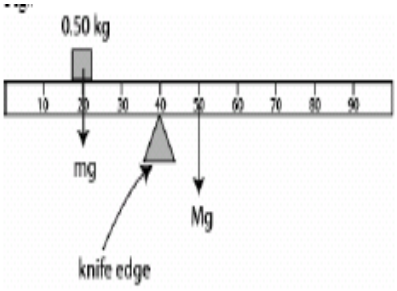
Q2. Fig. 2 shows a uniform beam with a weight of 60.0 *N* and length of 3.20 *m* is hinged at its lower end and a horizontal force F of magnitude 50.0 *N* acts at its upper end. The beam is held vertical by a cable that makes an angle θ = 30.0° with the ground and is attached to the beam at a height *h* = 1.60 *m*. The tension (T) in the cable is: (A: 115 N)



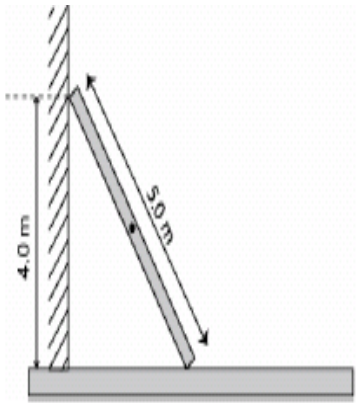
Q3. A solid copper sphere has a diameter of 85.5 cm. How much stress must be applied to the sphere to reduce its diameter to 85.0 cm? The bulk modulus of copper is 1.4×10^{11} N/m^2 (Ans: 2.4×10^{9} N/m^2)

T061

Q16. The volume of a solid Aluminum sphere at the sea level is V = 1.0 m^3. This sphere is placed at a depth of about 700 *m* in the sea where the absolute pressure is $p = 7.0 \times 10^{6}$ N/m^2. The change in the volume ΔV of the sphere is: (the bulk modulus of aluminum, $B = 70 \times 10^{9}$ N/m^2). A) 1.0×10^{-4} m^3



Q17. A uniform meter stick of mass *M* is balanced on a knife edge at the 40 *cm* mark by hanging a 0.50 *kg* mass at the 20 *cm* mark (see Fig. 8). Find *M (*A) 1.0 *kg)*



Q18. A 5.0 *m* long uniform ladder (with mass *m* = 12.0 *kg*) leans against a wall at a point 4.0 *m* above a horizontal floor as shown in Fig 9. Assuming the wall is frictionless (but the floor is not), determine the normal force exerted on the ladder by the wall. (A) 44 *N)*

T052:

Q16:A 5.0-m weightless rod (AC), hinged to a wall at A, is used to support an 800-N block as shown in Fig 5.The horizontal and vertical components of the force (F_H, F_V) of the hinge on the rod are: (Ans: F_H = 600 N, F_V = 800N)

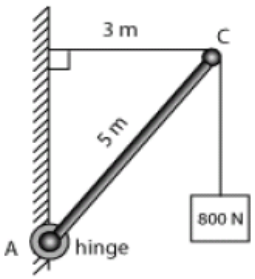


Figure 5

Q17:A shearing force *F* = 50 N is applied to an aluminum rod with a length of *L* =10 m, a cross-sectional area *A*=1.0 × 10^{-5} m^2, and a shear modulus G = 2.5 × 10^{10} N/m^2. As a result the rod is sheared through a distance (Δ*x*) of: (Ans: 0.20 cm)

Q18: A man holds a rod AB of length = 6.0 m and weight = 30 N in equilibrium, by exerting an upward force F_1, with one hand, and a downward force F_2, with the other hand as shown in Fig 6. What are the magnitude of the forces F_1 and F_2? (Ans: F_1 = 90 N, F_2 = 60 N)

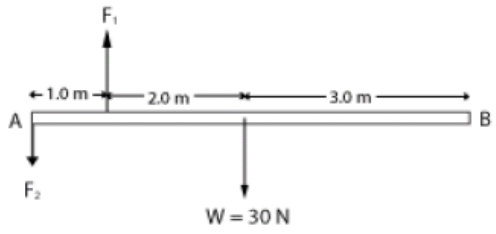


Figure 6

T051:

Q16 . A cube of volume 8.0 cm^3 is made of material with a bulk modulus of 3.5×10^9 N/m^2. When it is subjected to a pressure of 3.0×10^5 Pa, the change in its volume (ΔV) is (Ans: 6.9×10^{-4} cm^3)

Q17. A uniform rigid rod having a mass of 50 kg and a length of 2.0 m rests on two supports A and B as shown in the Fig. 3. When a block of mass 60 kg is kept at point C at a distance of *x* from the center, the rod is about to be lifted from A The value of *x* is: (Ans: 0.92 m)

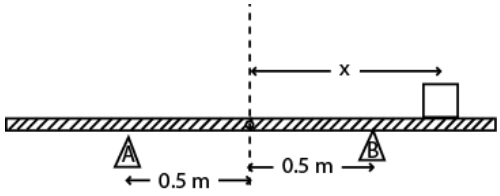


Figure 3

Q18. A uniform beam having a mass of 60 kg and a length of 2.8 m is held in place at its lower end by a pin (P). Its upper end leans against a vertical frictionless wall as shown in the Fig. 4. What is the magnitude of the force by the pin on the beam? (Ans: 706 N)

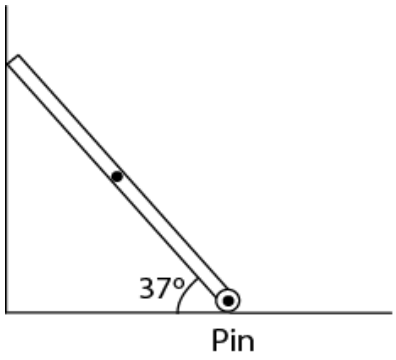


Figure 4

T042:

Q2 A horizontal aluminum rod (shear modulus = $2.5\text{x}10^{10}$ N/m^2) projects L=5.0 cm from the wall (see Fig 6). The cross sectional area of the rod A =$1.0\text{x}10^{-5}$ m^2. A shearing force of 500 N is applied at the end of the rod. Find the vertical Δx of the end of the rod. (Ans: $1.0\text{x}10^{-4}$ m)

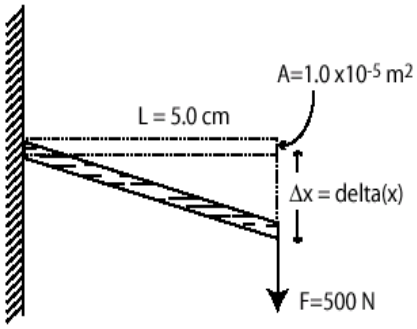


Figure 6

Q3 A uniform rod AB is 1.2 m long and weighs 16 N. It is suspended by strings AC and BD as shown in Fig 2. A block P weighing 96 N is attached at point E, 0.30 m from A. The tension in the string BD is: (Ans: 32 N)

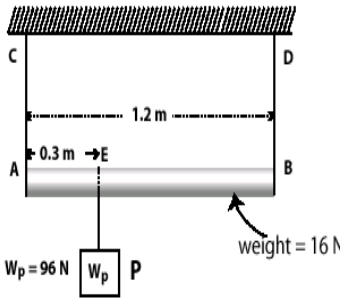
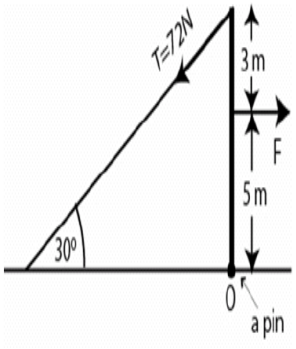


Figure 2

T041:



Q1 A 20 kg uniform ladder is leaning against a frictionless wall and makes an angle of 60 degrees with the horizontal. The ladder being at rest find the magnitude of the frictional force exerted on the ladder by the floor? (Ans: 57 N)

Q2 A uniform beam is held in a vertical position by a pin at its lower end and a cable at its upper end (see Fig 4). The tension in the cable is 72 N. Find the horizontal force F acting on this beam. (Ans: 100 N)

Q3 A certain wire stretches 1.0 cm when a force F is applied to it. The same force is applied to a second wire of the same material but with twice the diameter and twice the length. The second wire stretches: (Ans: 0.50 cm)