Indian Institute of Technology Guwahati
ME 101: Engineering Mechanics (2016-2017, Sem II)

Tutorial 4   (13.02.2017) (Div 1 & 4)

Q1. A cylinder of 20 cm diameter and having weight 10 KN as shown in Fig.1 is held at rest on the 30° incline by a weight P suspended from a cord wrapped around the cylinder. If slipping impends, determine P and the coefficient of friction.

Q.2. A 6 m long ladder has a mass of 18 kg and its center of gravity is 2.4 m from the bottom. The ladder is placed against a vertical wall so that it makes an angle of 60° with the ground as shown in Fig. 2. How far up the ladder can a 72-kg man climb before the ladder is on the verge of slipping? The angle of friction at all contact surfaces is 15°.
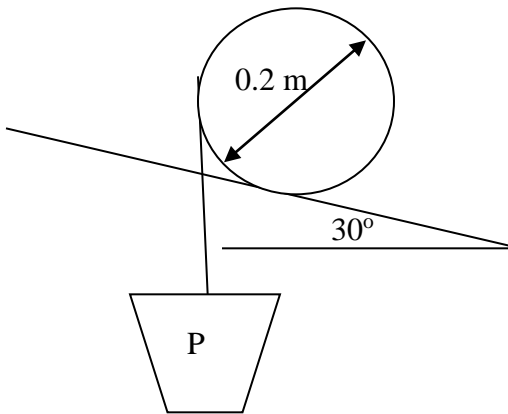

Fig. 1

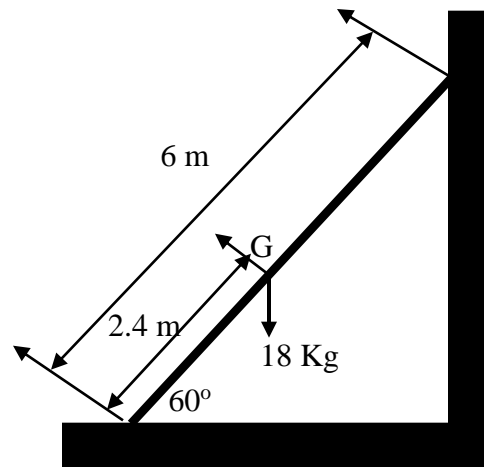Fig. 2.

Q.3. Determine the value of P just sufficient to start the 10° wedge under the 40-kN block as shown in Fig 3. The angle of friction is 20° for all contact surfaces.
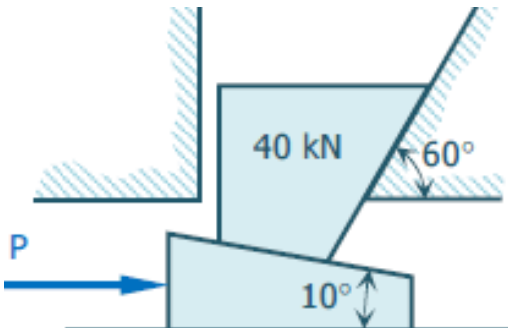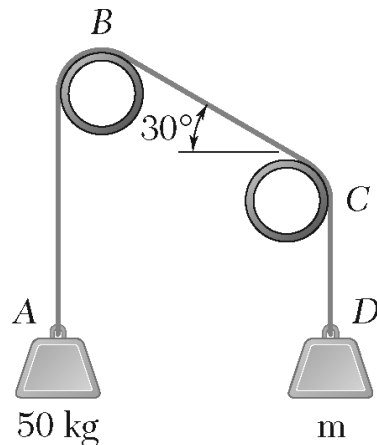

Fig. 3

Fig. 4.

Q.4 A rope *ABCD* is looped over two pipes as shown in Fig. 4. The coefficient of static friction is 0.25 for all contacts, determine (*a*) the smallest value of the mass *m* for which equilibrium is possible, (*b*) the corresponding tension in portion *BC* of the rope.

Q.5. The speed of the brake drum as shown in Fig. 5 is controlled by a belt attached to the control bar *AD*. A force **P** of magnitude 100 N is applied to the control bar at *A*. Determine the magnitude of the couple being applied to the drum, knowing that the coefficient of kinetic friction between the belt and the drum is 0.25, that *a* = 5 cm., and that the drum is rotating at a constant speed (*a*) counterclockwise, (*b*) clockwise

Q 6. In the machinist's vise shown, the movable jaw D is rigidly attached to the tongue AB that fits loosely into the fixed body of the vise. The screw is single-threaded into the fixed base and has a mean diameter of 2 cm and a pitch of 0.6 cm. The coefficient of static friction is 0.25 between the threads and also between the tongue and the body. Neglecting bearing friction between the screw and the movable head, determine the couple that must be applied to the handle in order to produce a clamping force of 4 KN.
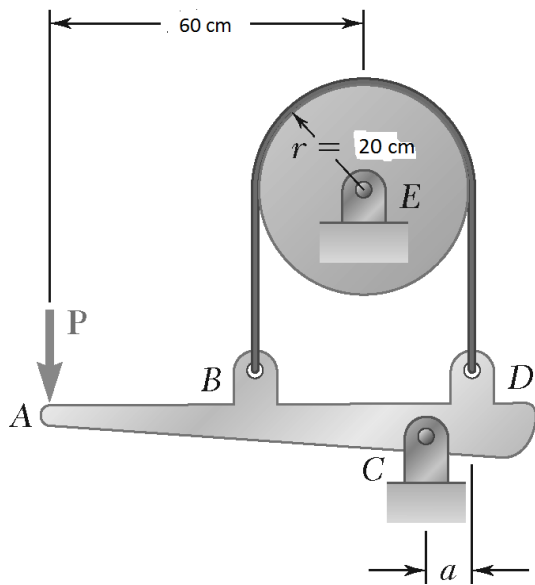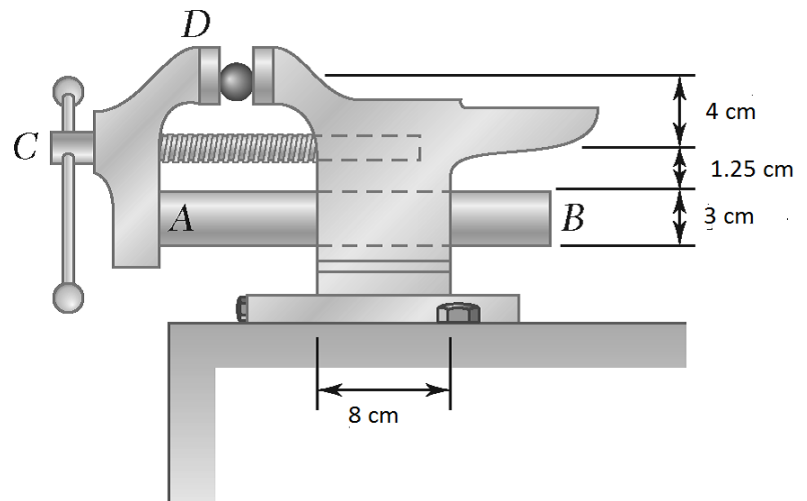

Fig. 5

Fig. 6.