Branch: Common to all

Year: FE Semester: I

Subject: Engineering Mechanics

Time: 02:00pm – 03:00 pm

Date: 01/11/2019

No. of Pages: 01

Marks: 20 Marks

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

Note the following instructions.
1. All questions are compulsory, however there are internal choices.
2. Draw neat diagrams wherever possible.
3. Write everything in ink (no pencil) only.
4. Assume data, if missing, with justification.

| Q.1.	**Attempt any five.**	Marks	Course Outcome
a.	State Laws of Friction.	2M	CO 3
b.	Define Direct Central Impact and Coefficient of Restitution.	2M	CO 6
c.	A 50 kg block, kept on the top of a 15º slopping surface, is pushed down the plane with an initial velocity of 20 m/s. If the coefficient of kinetic friction between the two surfaces is 0.4, determine the acceleration of the block.	2M	CO 6
d.	Draw the Free body diagram for the ladder shown in Figure 1. Consider the impending motion of point A to the right.	2M	CO 3
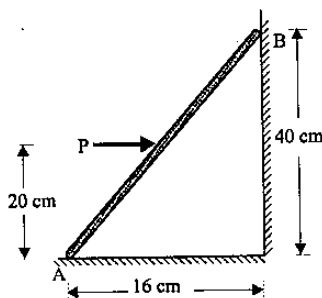
Figure 1   Figure 2

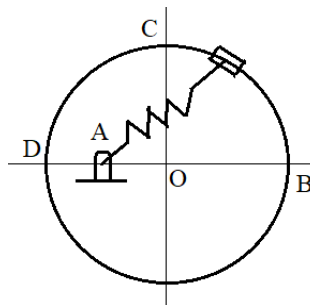|			
e.	Find the work done by spring when the collar moves along a circular ring from point B to point C. The spring is un-deformed when at B. (Refer Figure 2) The radius of ring is 200 mm and AD is 100mm. Take the spring stiffness value as 50N/mm.	2M	CO6
f.	An elevator has a downward acceleration of 1 m/s². What pressure will be transmitted to the floor of the elevator by a person weighing 500N travelling in it?	2M	CO 6

ALL THE BEST

Q.2. **Attempt any one**.

a. Determine the force P to cause motion to impend down the plane. Masses of blocks   5M   CO 3
A & B are 9 kg and 4 kg respectively and the value of static friction between both
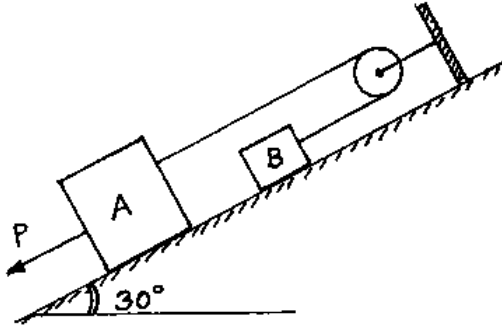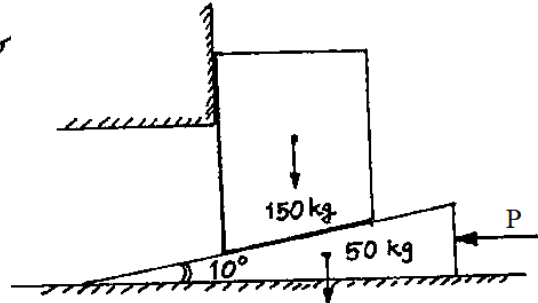the blocks and the plane is 0.25. Refer Figure 3.

Figure 3   Figure 4

b. A block of mass 150kg is raised by inserting a 10^0 wedge (mass 50kg) under it   5M   CO 3
and by applying a horizontal force, P as shown in Figure 4. Taking coefficient of
friction between all surfaces of contact as 0.3, find force, P to raise the block.

Q.3. **Attempt any one.**

a. A 3000N block shown in Figure 5 slide down a 50° incline. It starts from rest.   5M   CO 6
After moving 2m it strikes a spring whose modulus is 20 N/mm. If the coefficient
of friction between block and incline is 0.2, determine the maximum deformation
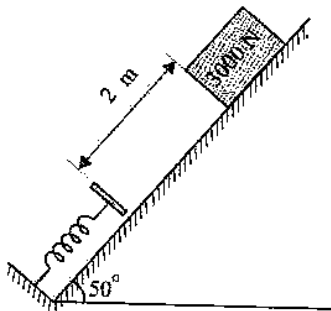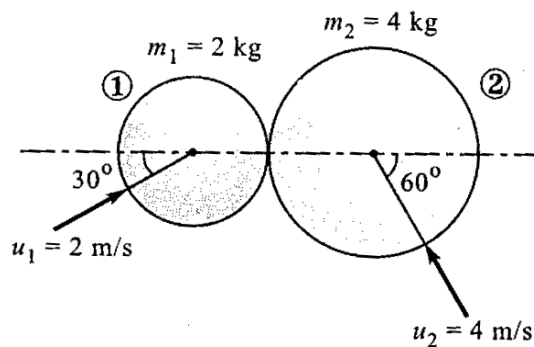of the spring.

Fig 5   Fig 6

b. Two smooth spheres 1 and 2, having mass of 2 kg and 4 kg respectively, collide   5M   CO 6
horizontally with initial velocities as shown in Figure 6. If the coefficient of
restitution for the colliding bodies is 0.8, determine the velocities of each sphere
after collision.

ALL THE BEST