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II/IV B.E. DEGREE EXAMINATION.

First Semester

Civil Engineering

ENGINEERING MECHANICS

(Effective from the admitted batch of 2007–2008)

Time : Three hours　　　　　　　　Maximum : 70 marks

Answer any FIVE questions.

First question is compulsory.

All questions carry equal marks.

1. (a) Define the law of parallelogram of forces. What is the use of this law?

   (b) What is the different between collinear and concurrent forces?

   (c) What are the important types of loading on a beam?

   (d) What do you understand by axes of reference?

   (e) State the laws of solid friction.

(f) Define :

    (i)   velocity of projection

   (ii)   angle of projection

    (iii) time of flight.

(g) State the law of conservation of momentum.

2. (a) Three bars in one plane, hinged at their ends as shown in Fig. 1 are sumitted to the action of a force P = 100 N applied at B. Determine the magnitude of the force φ that will be necessary to apply at the hinge C in order to keep the system of ban in eqlbm in the position shown.
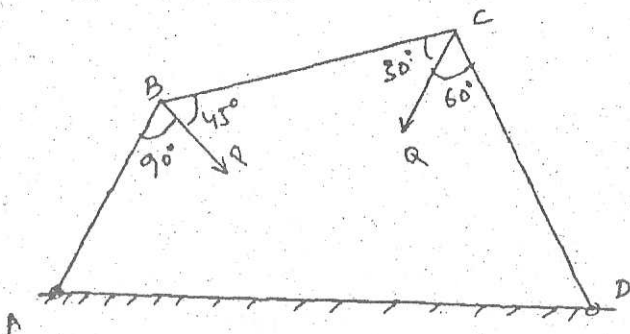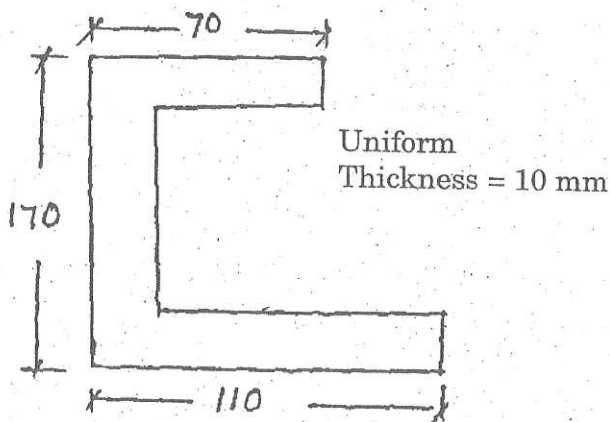

(b) Find the resultant of the following system of forces acting at a point :

40 N towards the east

100 N towards 30° north of east

150 N towards north

200 N towards southwest.

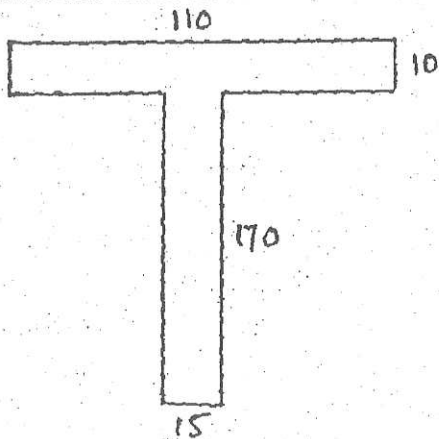2   **[01 – 2111]**

3. (a) Determine the C.G of a quadrant AB of the are of a circle of radius R on shown in Fig.
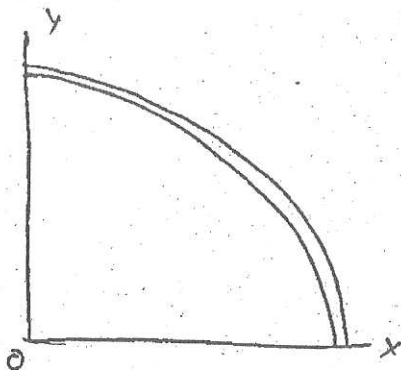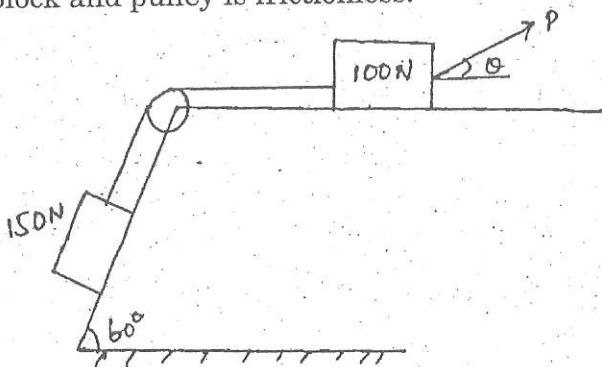

(b) Locate the C.G for the Shaded area

Uniform
Thickness = 10 mm

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4. (a) State and prove the parallel axes theorem on moment of inertia for a place area.

   (b) Determine the M.O.I. for the place area about its centroidal x-axes.

5. Determine the least value of P to cause motion to impend towards right. Take $\mu = 0.2$ under the block and pulley is frictionless.

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6. (a) A stove dropped into a well in heard to strike the water after 4 sec. Find the depth of the well, if the velocity 9 sound in 350 m/s.

   (b) A motor cyclist wants to clear the ditch shown in fig. If the ramp at B is of 25°, determine the minimum speed of the motor cycle at B.
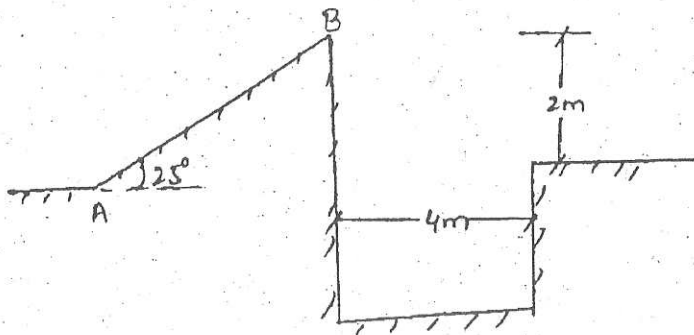
7. (a) State and prove work energy principle.

   (b) A bullet of man 25 gm, moving horizontal with a velocity of 600 m/s striker a wooden block of man 5 kg resting an a rough horizontal surface the bullet after striking the block remain buried in the block and both travels a distance of 90 cm, before coming to rest. Determine :

   (i) the average resistance between the block and surface

   (ii) the coefficient of friction between the block and horizontal surface.

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8. (a) State and explain principle of virtual work.

   (b) The diameters of the two steps of the pulley of a weston's differential pulley block are 40 cm and 30 cm respectively. Determine the value of the effort required to lift a load of 4 KN using principle of virtual work. Neglect the frictional forces.