LIB
19/6/13 FN

Reg. No. :

Question Paper Code : 53017

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Second Semester

Civil Engineering

GE 204 — ENGINEERING MECHANICS

(Common to all Branches)

(Regulation 2007)

Time : Three hours　　　　Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Two forces are acting on the ring as shown in Fig. 1. Find the magnitude and direction of the resultant force on the ring.

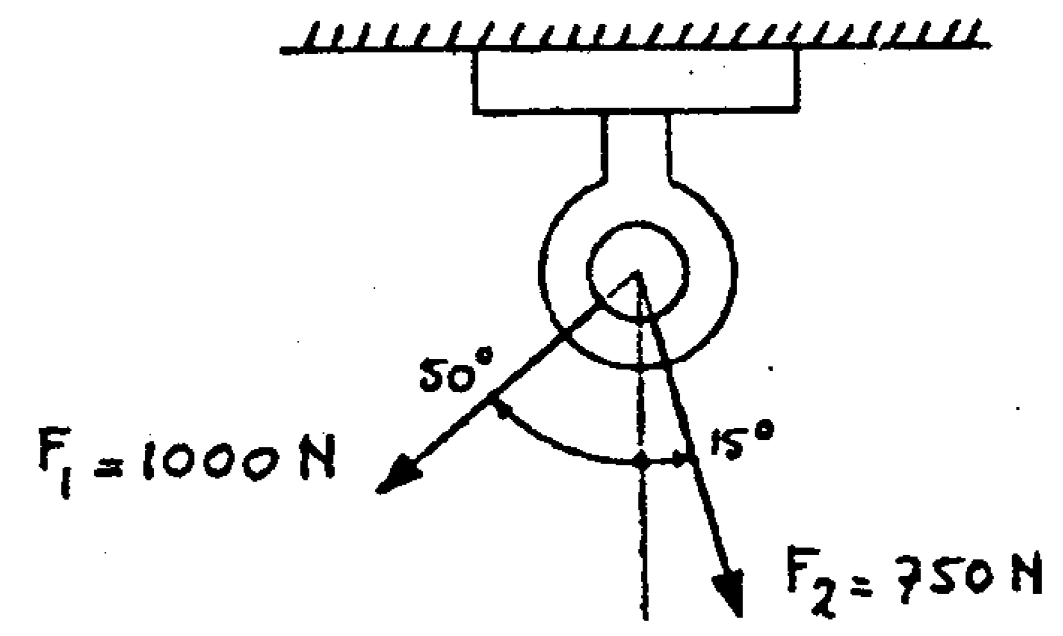

Fig. 1

2. Find the unit vector along the line AB shown in Fig.2.

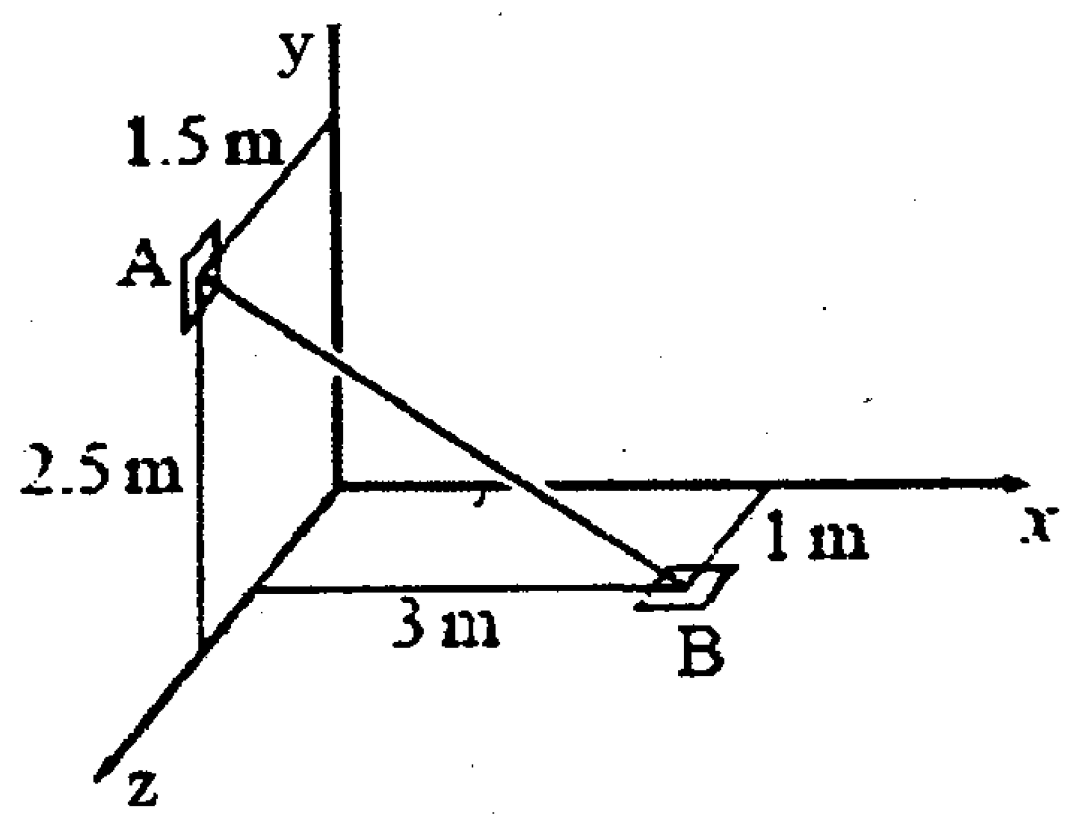

Fig. 2

3. Find the moment of the force about the point O in Fig. 3.

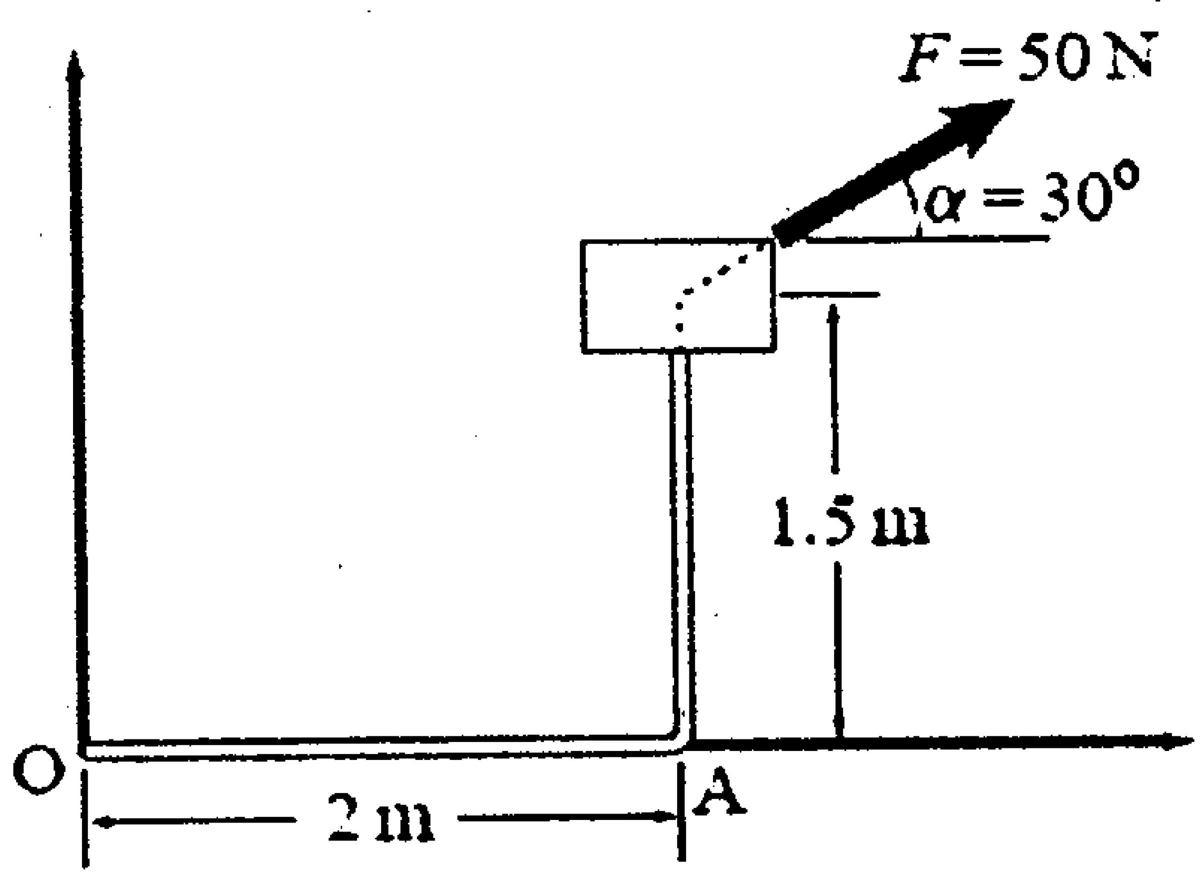

Fig. 3

4. Draw a hinged support and roller support and highlight the reactions on both supports.

5. Define parallel axes theorem.

6. Derive the area moment of inertia of a rectangle about its base by integration method.

7. State the principle of work energy.

8. Define coefficient of restitution.

9. Draw the free body diagram of a thin rod (Fig. 9) of mass m rests against a smooth wall and a floor with more than enough friction to prevent slip. There is gravity.

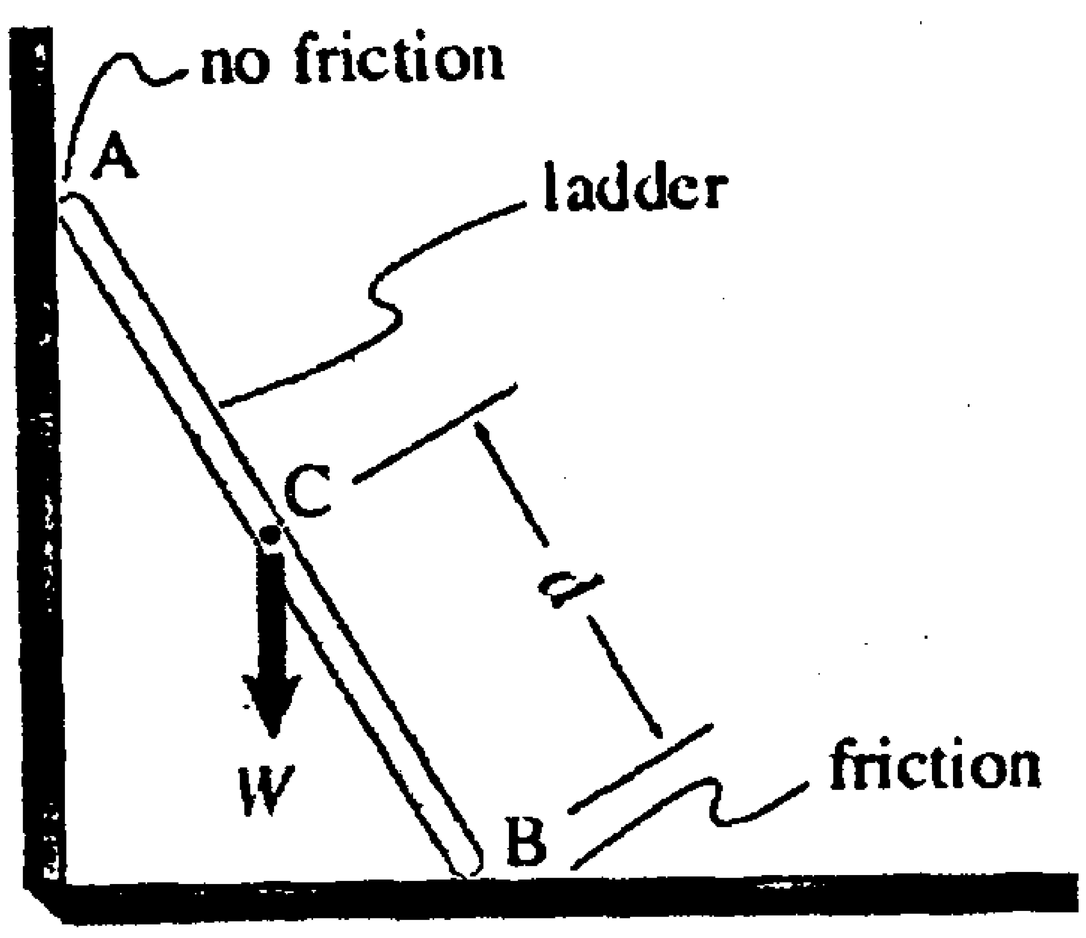

Fig. 9

10. For the system shown in Fig 10, draw the free body diagram of block B. At the time of interest block B moves rightwards and block A moves leftwards.

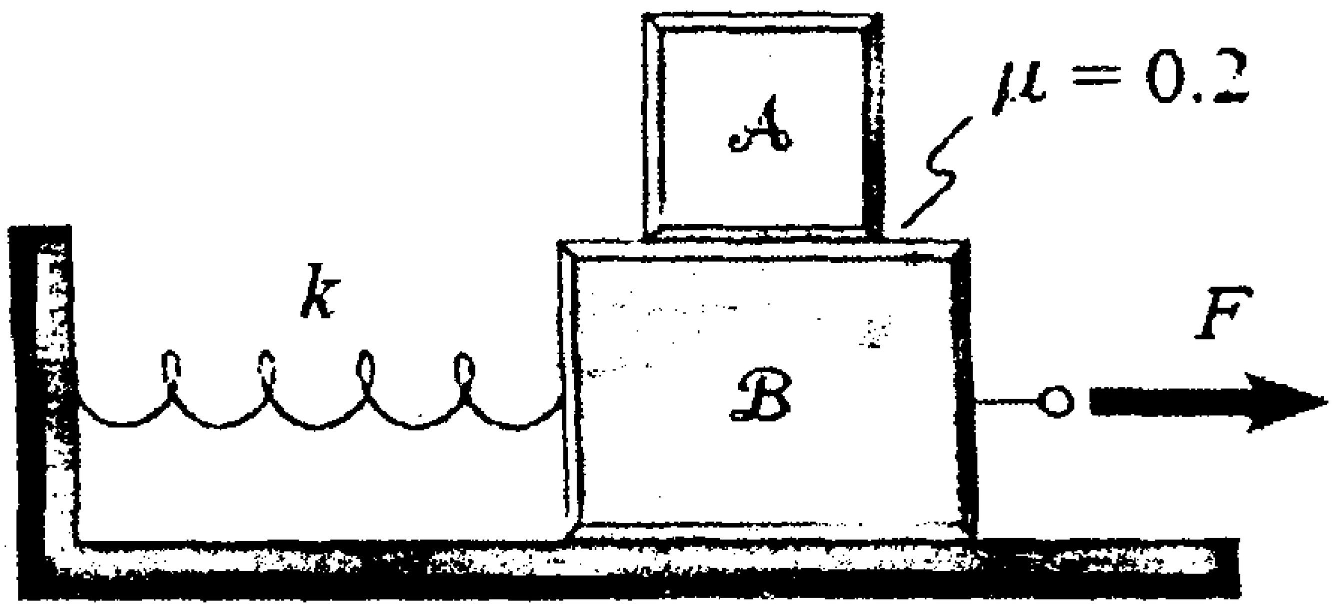

Fig. 10

PART B — (5 × 16 = 80 marks)

11. (a) Draw the particle in Fig. 11a and determine all the forces that are acting on it.

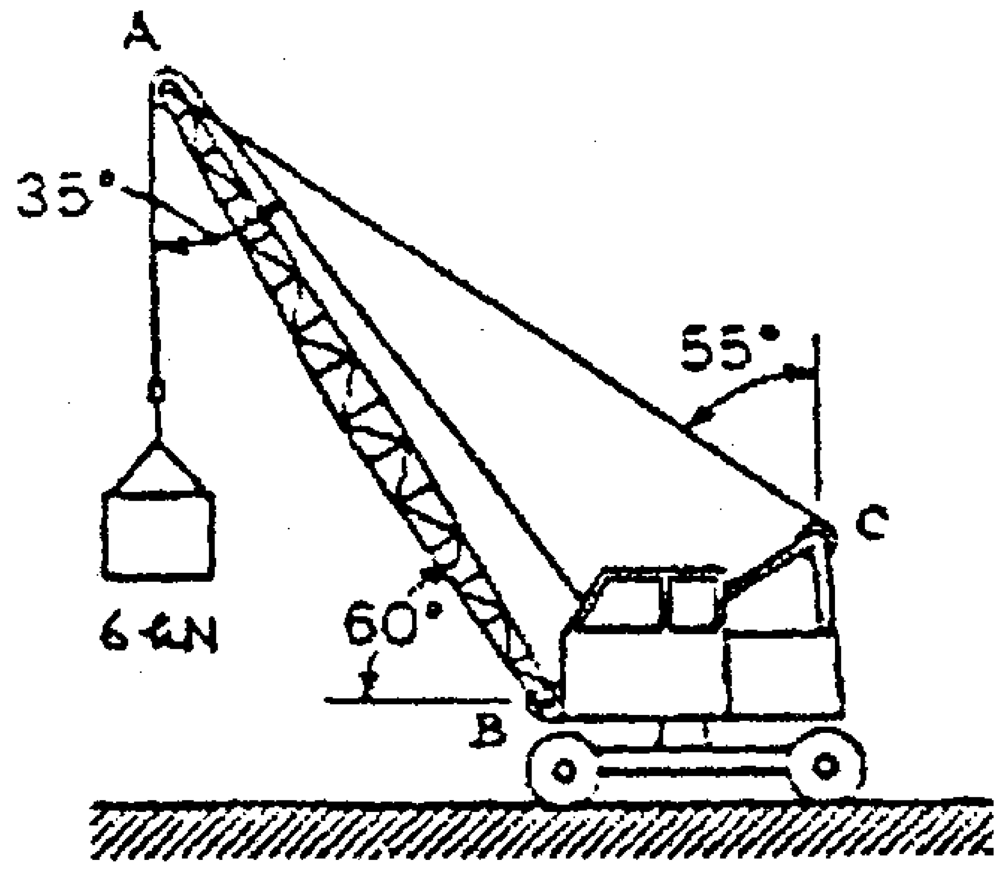

Fig. 11a

Or

(b) The lines of action of three forces concurrent at the origin O passes respectively through points A(-1,2,4)m, B(3,0,-3)m and C(2,-2,4)m. The magnitude of the forces are F_A = 40N, F_B = 10N and F_c = 30N. Find the magnitude and direction of their resultant.

12. (a) Determine the equivalent force couple system about point D shown in Fig. 12a.

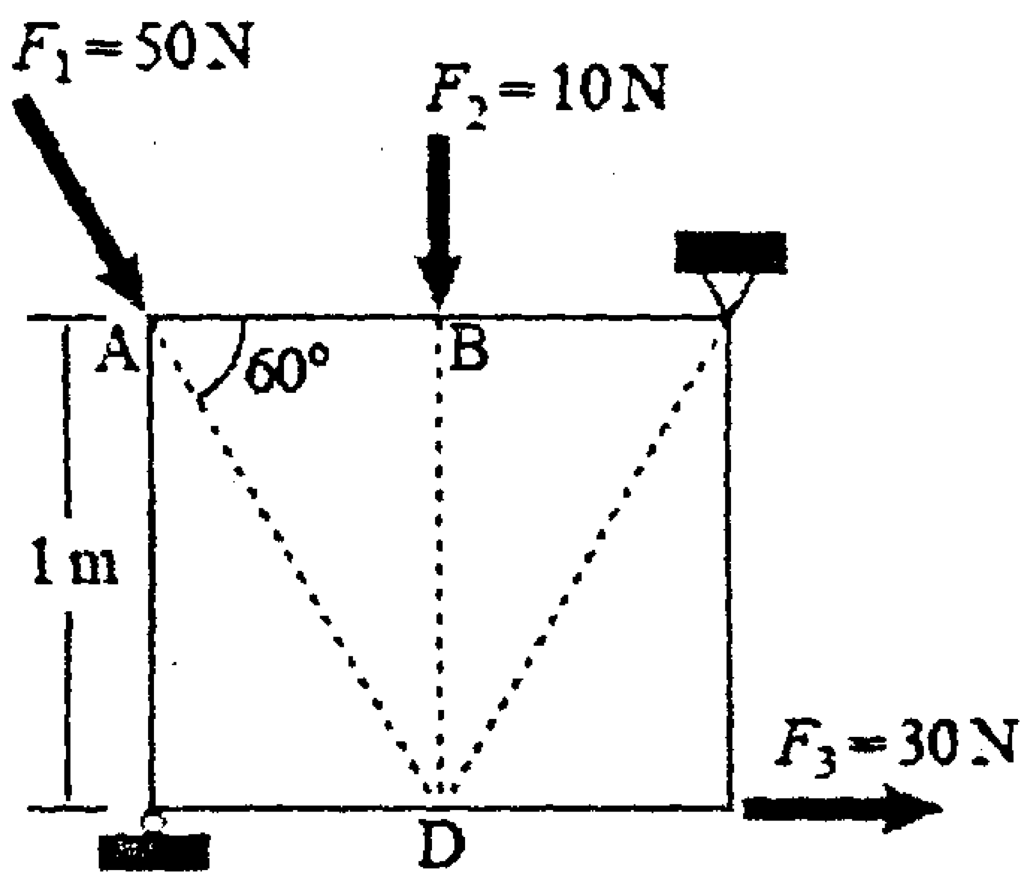

Fig. 12a

Or

(b) For static equilibrium of the system shown in Fig. 12b, find the support reactions at the end A of the bar.

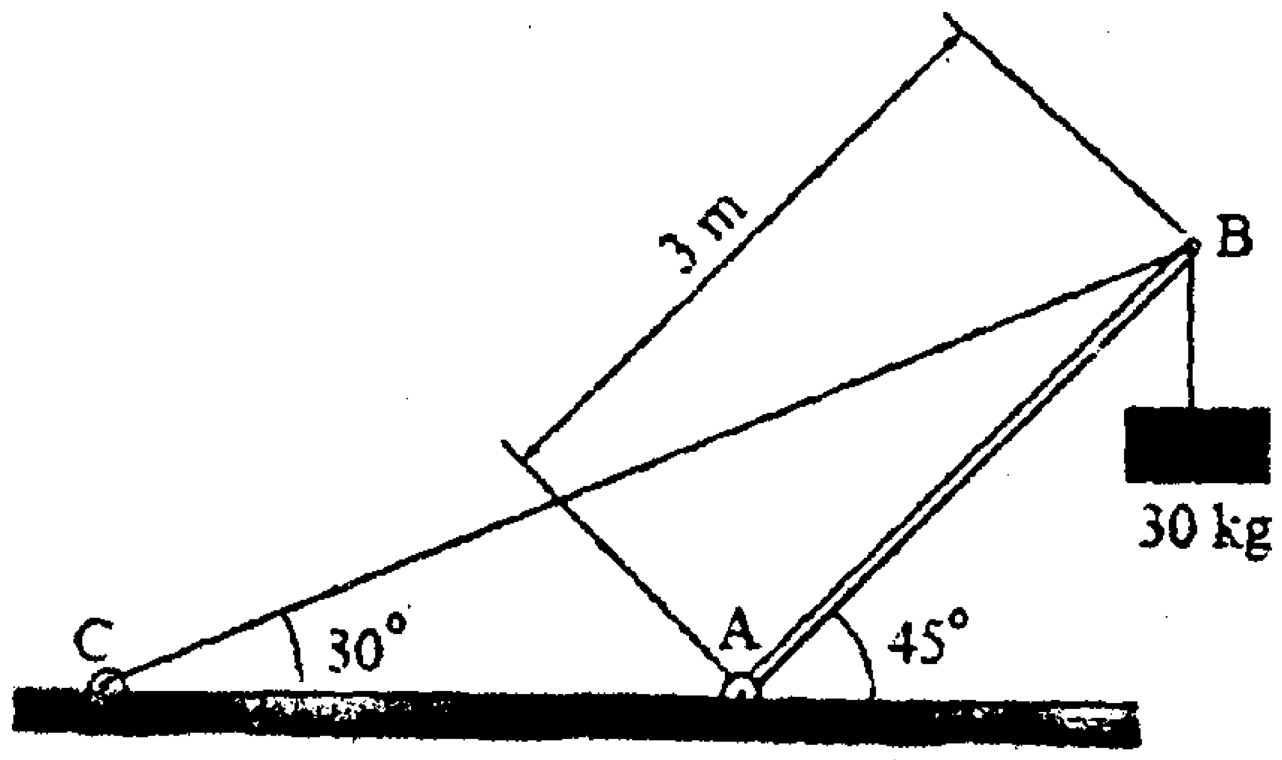

Fig. 12b

13. (a) Determine the moment of inertia of the area shown in Fig.13a about the x and y axis.

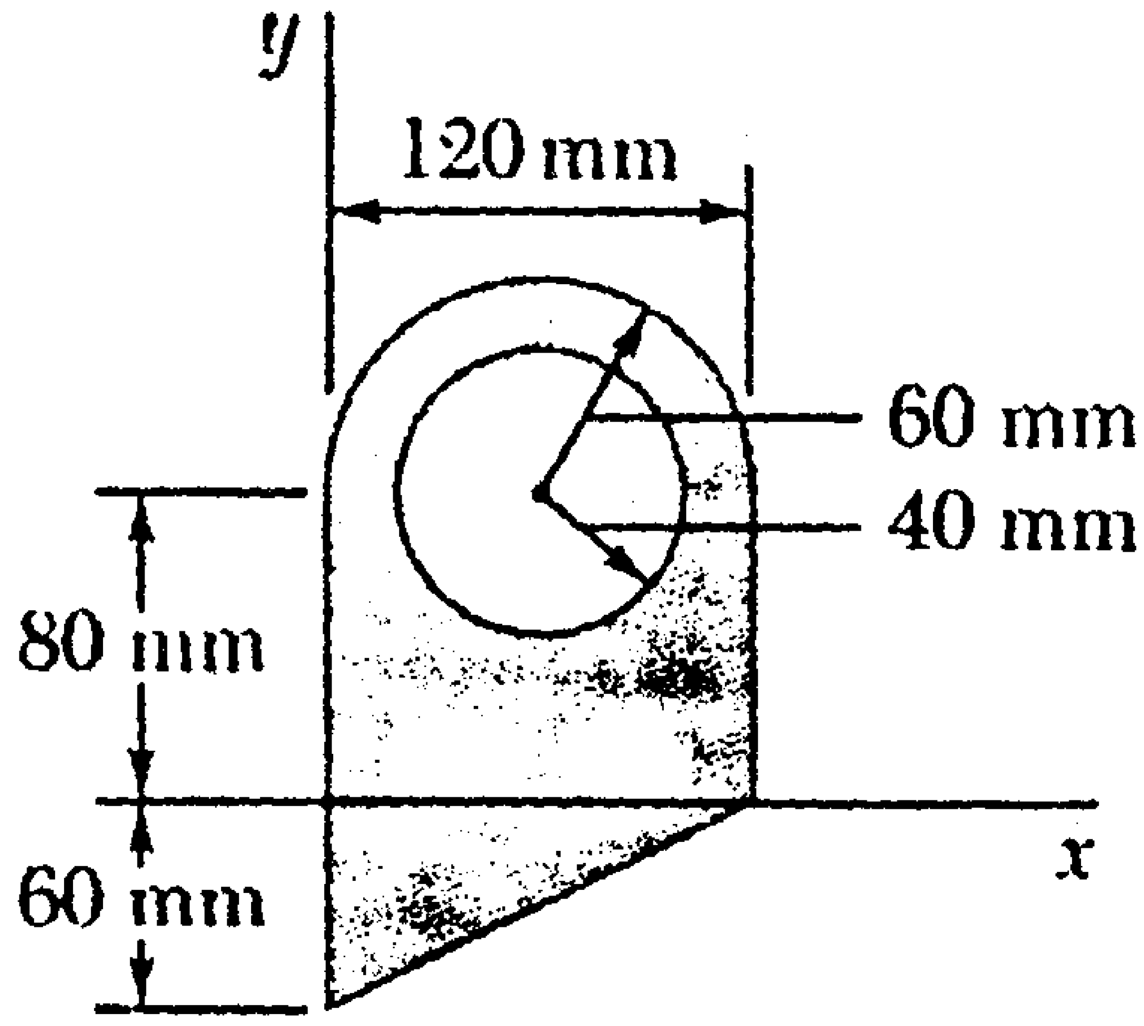

Fig.13a

Or

(b) Determine the polar moment of inertia of the area shown in Fig. 13b about the axis passing through point O.

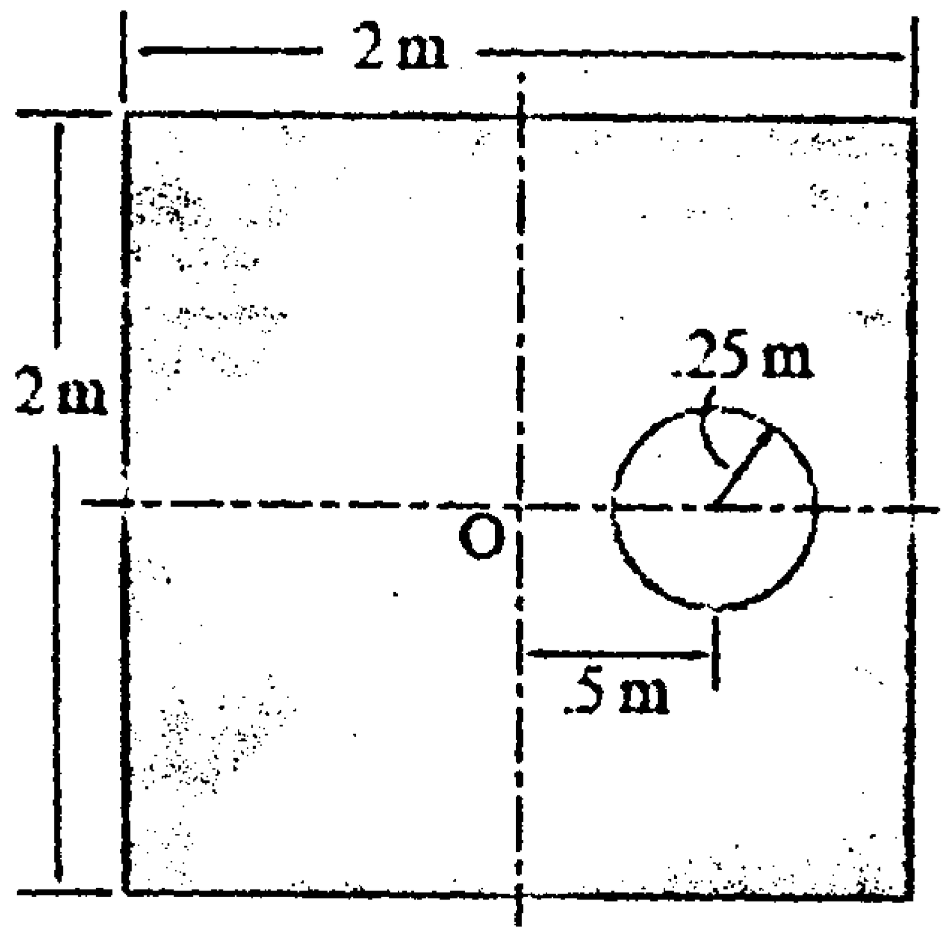

Fig.13b

14. (a) A ball is dropped from a height of 10m onto a hard surface. After the first bounce, it reaches a height of 6.4 m. What is the vertical coefficient of restitution? What is the height of the second and third bounce?

Or

(b) A block of mass 0.5 kg shown in Fig.14b is released from point A of an inclined ($\theta = 45^\circ$) frictionless surface. The mass slides down the incline for a distance of 2m before hitting an obstacle at point C. Find the velocity of the block just before it hits the obstacle.

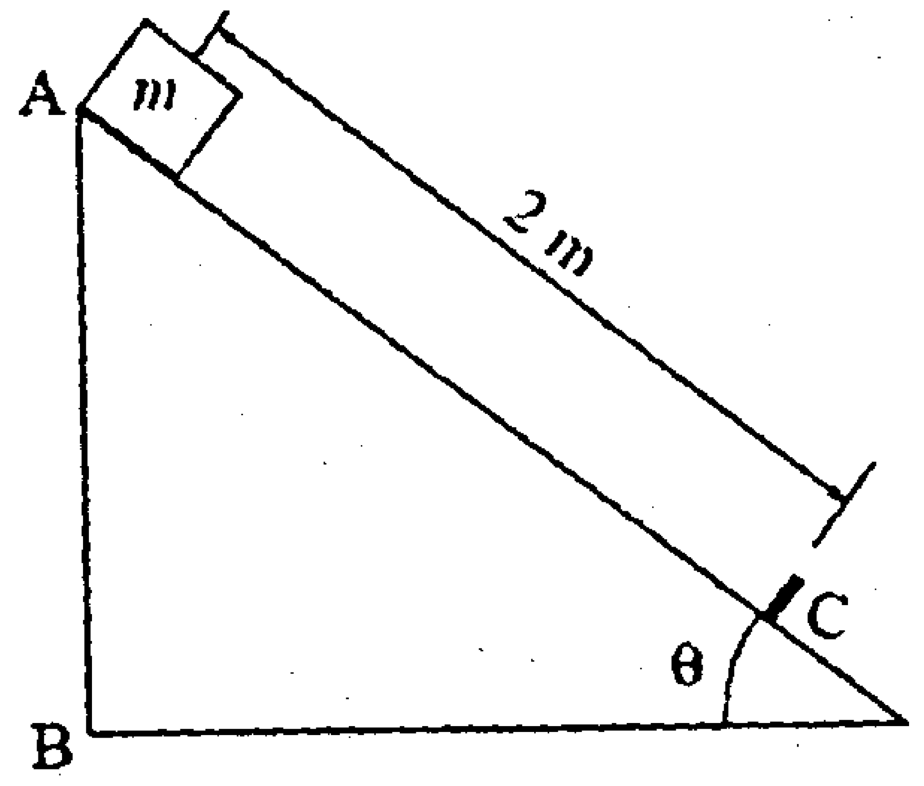

Fig. 14b

15. (a) Three flat blocks are positioned on the 30° incline as shown in Fig. 15a, and a force P parallel to the incline is applied to the middle block. The upper block is prevented from moving by a wire which attaches it to the fixed support. The coefficient of static friction for each of the three pairs of mating surfaces is shown. Determine the maximum value which P may have before any slipping takes place.

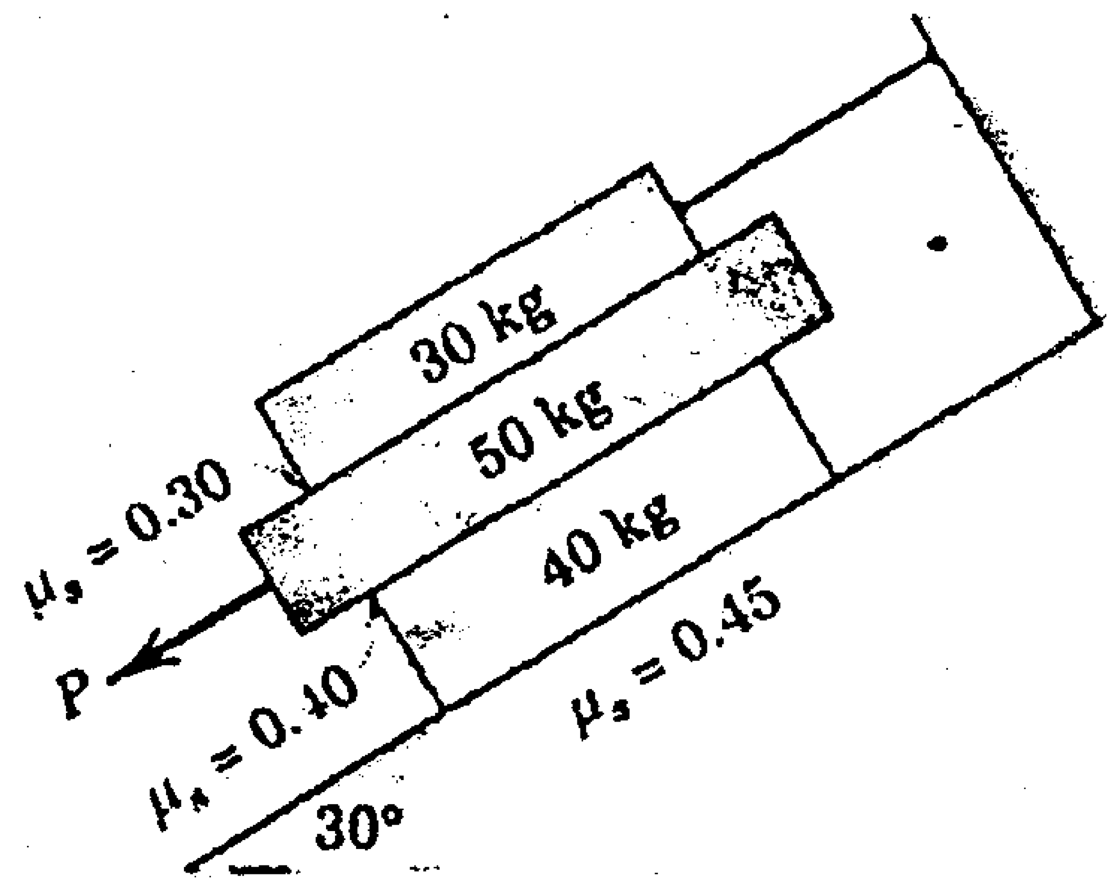

Fig. 15a

Or

(b) The 1.2 kg wooden block (Fig. 15b) is used for level support of the 9kg can of paint. Determine the magnitude and direction of the friction force exerted by the roof surface on the wooden block and the total force exerted by the roof surface on the wooden block.

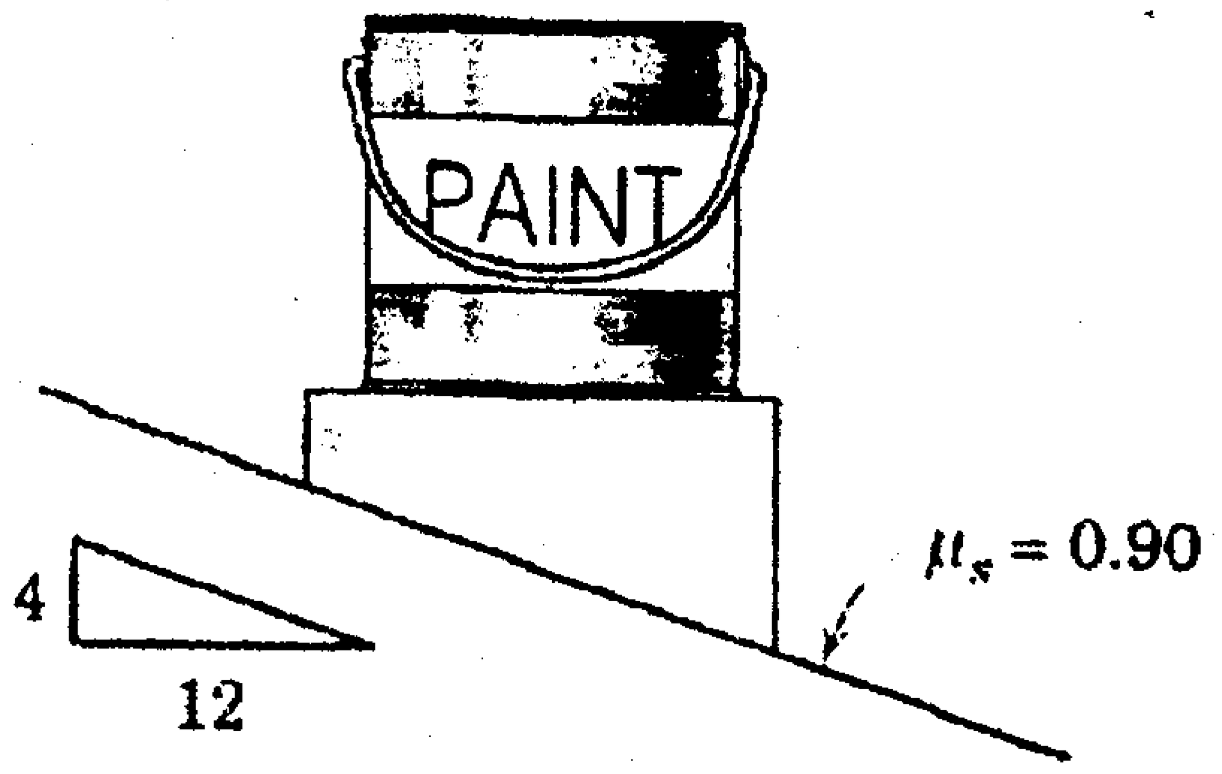

Fig. 15b