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Question Paper Code : 13017

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Second Semester

Civil Engineering

GE 204 — ENGINEERING MECHANICS

(Common to All Branches)

(Regulations 2007)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Two forces 60N and 65N act on a screw at an angle of 25° and 85° from the base. Determine the magnitude and direction of their resultant.
2. State the principle of Transmissibility.
3. What do you mean by the term "radius of gyration"?
4. State the theorem of perpendicular axis, as applied to Moment of inertia.
5. State Pappus—Guldinus theorems.
6. Find the moment of inertia of a rectangle of width 50 mm and height 100 mm about a horizontal axis passing through its centroid.
7. A particle moves along a straight line so that its displacement in metre from a fixed point is given by, $s = t^3 + 3t^2 + 4t + 5$, where t is in seconds. Find the velocity of the particle after 4 seconds.
8. A bullet is fired with an initial velocity of 15m/s at an angle of 30° with the horizontal. Determine the range of the projectile.
9. Draw the free body diagram of a thin rod (Fig. Q9) of mass m that rests against a smooth wall and a floor with more than enough friction to prevent slip. There is gravity.

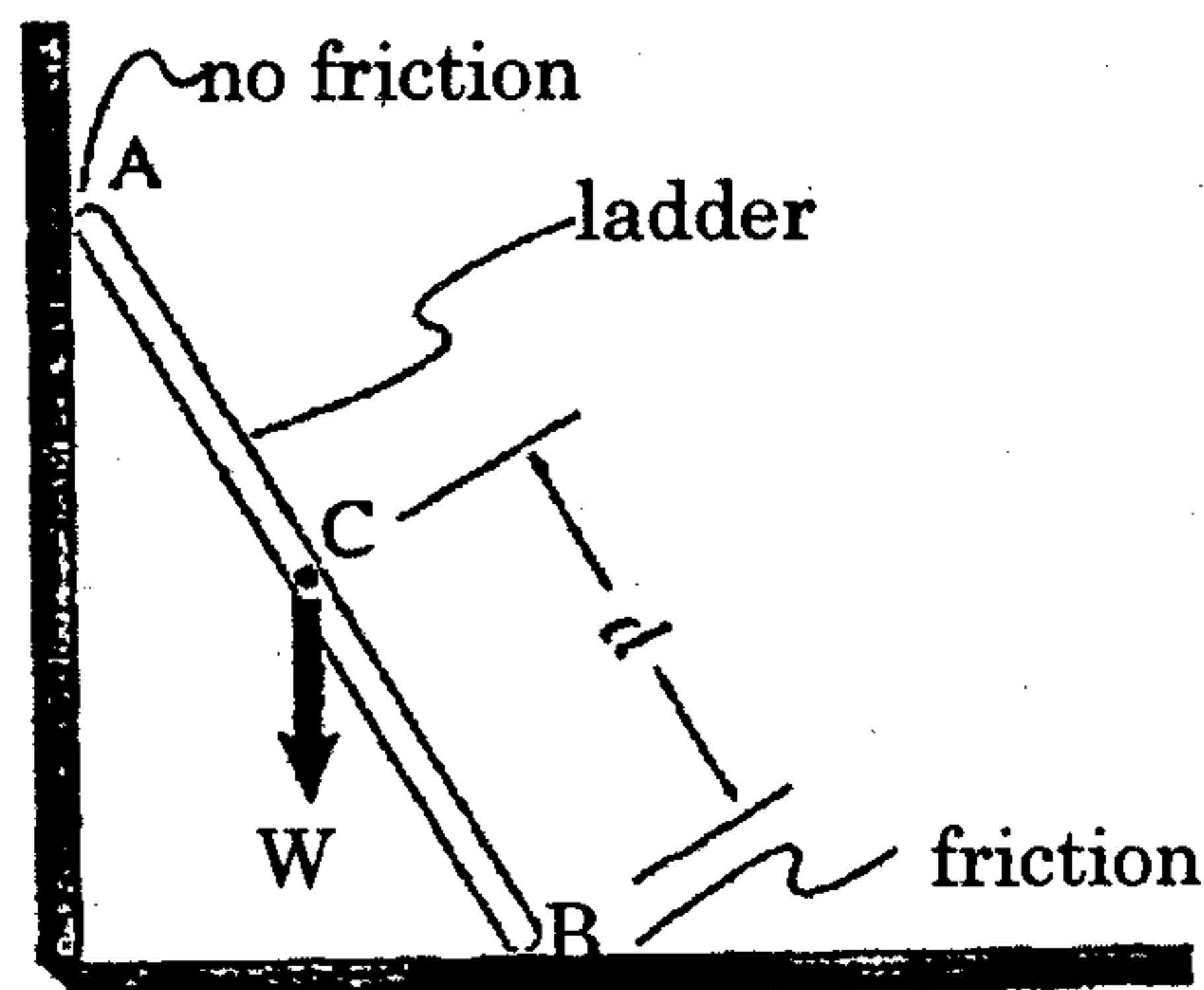


Fig.Q9.

10. For the system shown in Fig. Q10 draw the free body diagram of block B. At the time of interest block B moves rightwards and block A moves leftwards.

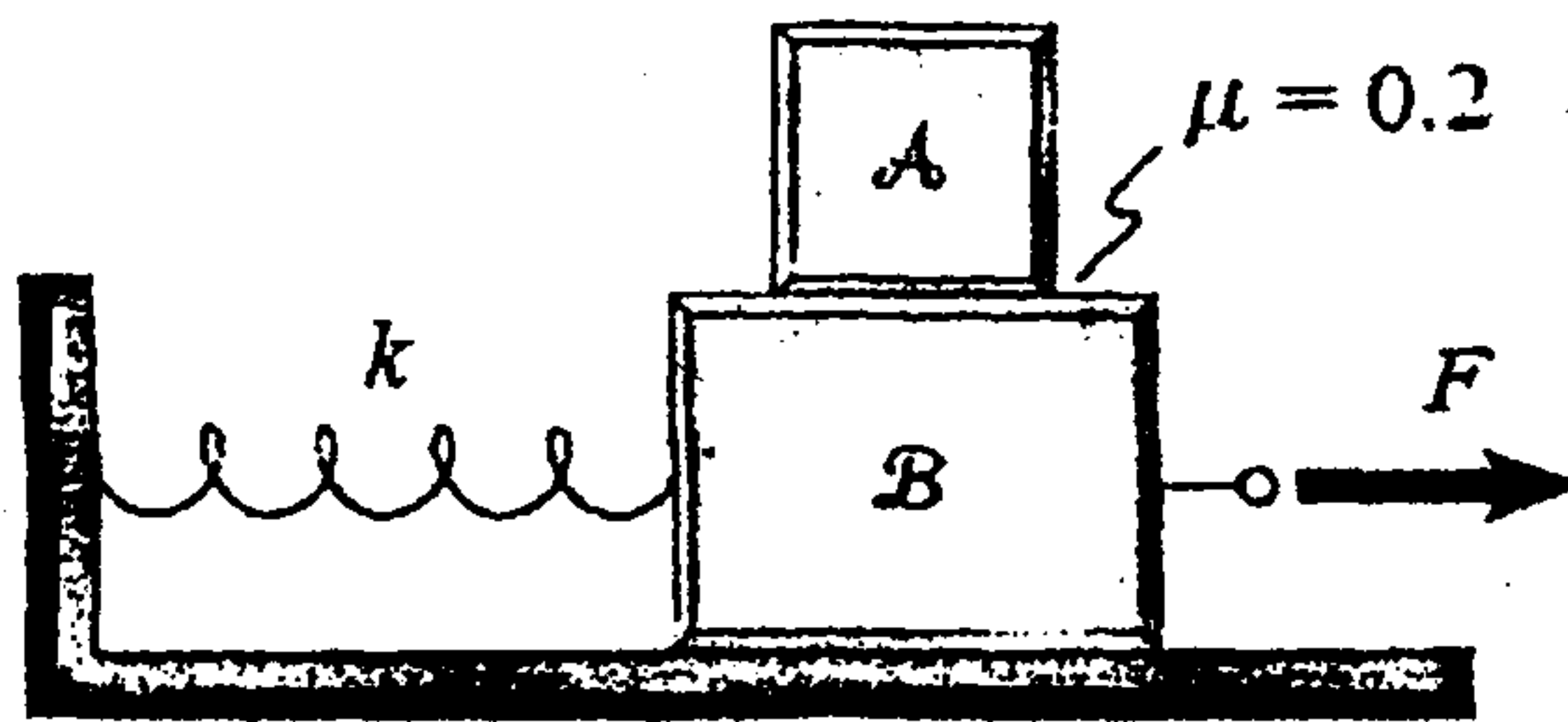


Fig. Q. 10.

PART B — (5 × 16 = 80 marks)

11. (a) A system of five forces of magnitude 4 kN, 5 kN, 6 kN, 7 kN and 8 kN acts at one of the angular points of a regular hexagon as shown in Fig. 11(a). Find the magnitude and direction of the resultant of the system of forces.

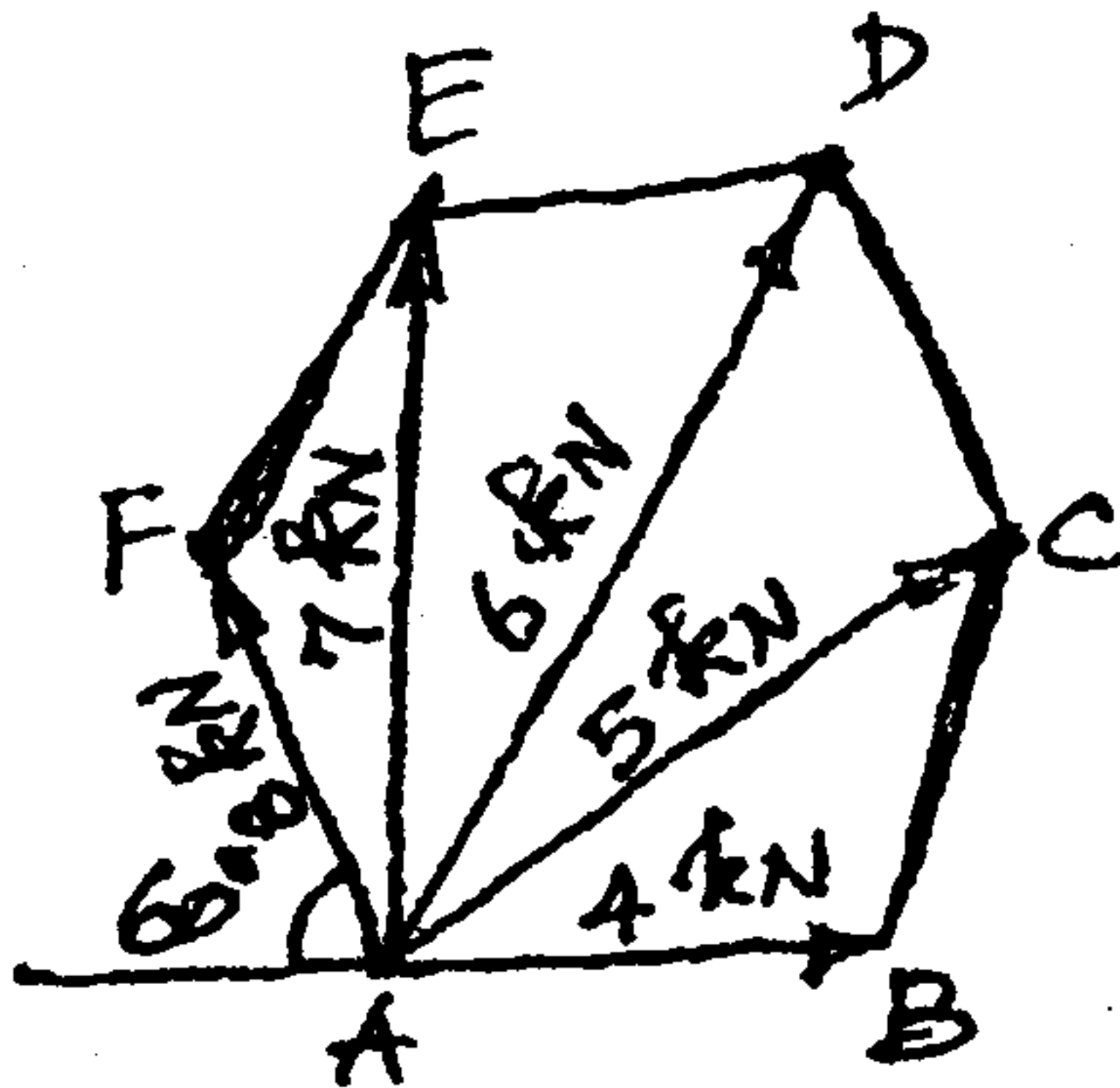


Fig.11(a).

Or

- (b) A system of forces acts as shown in Fig. 11(b). Find the magnitude of A and B so that the resultant of the force system passes through P and Q.

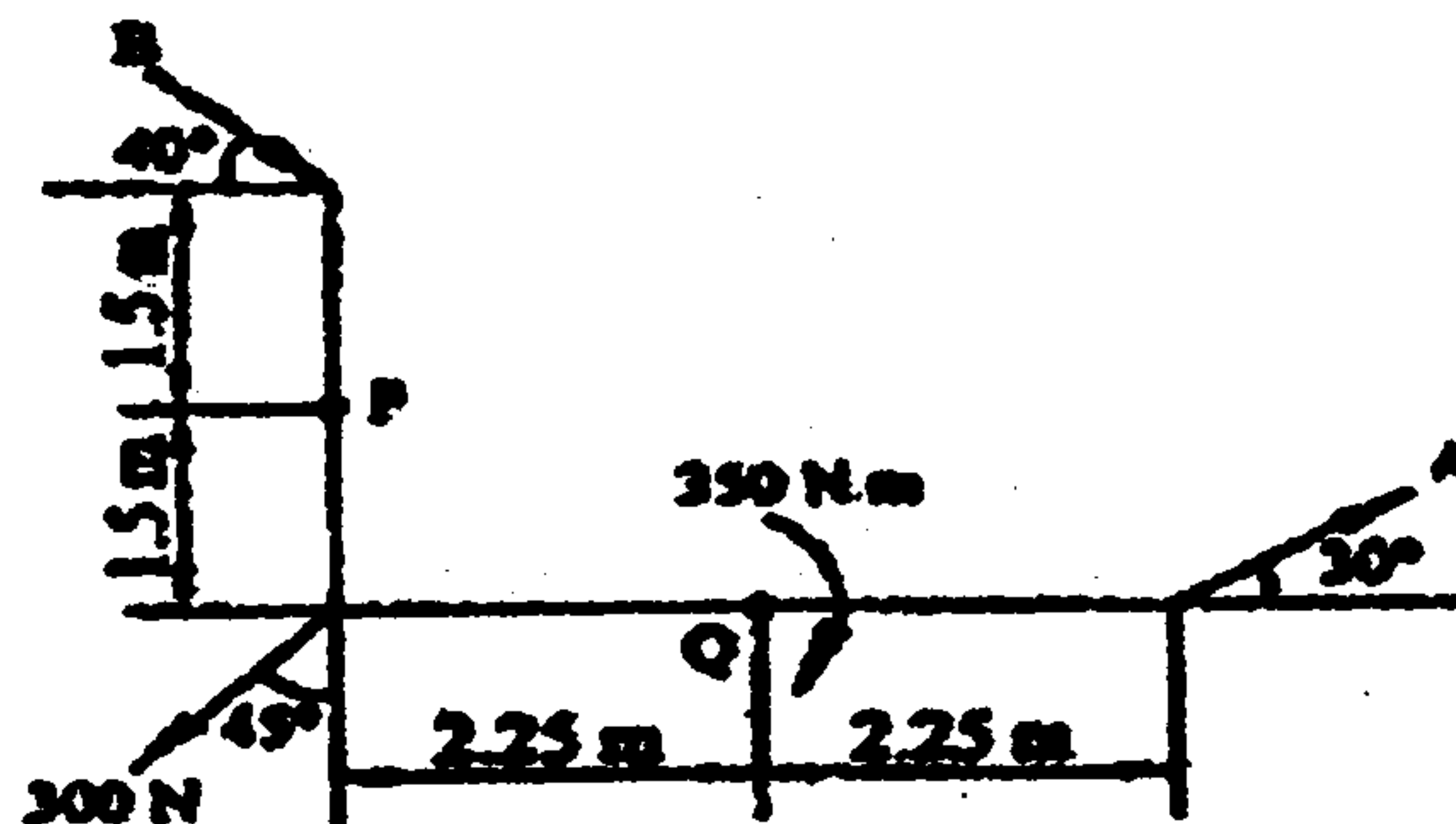
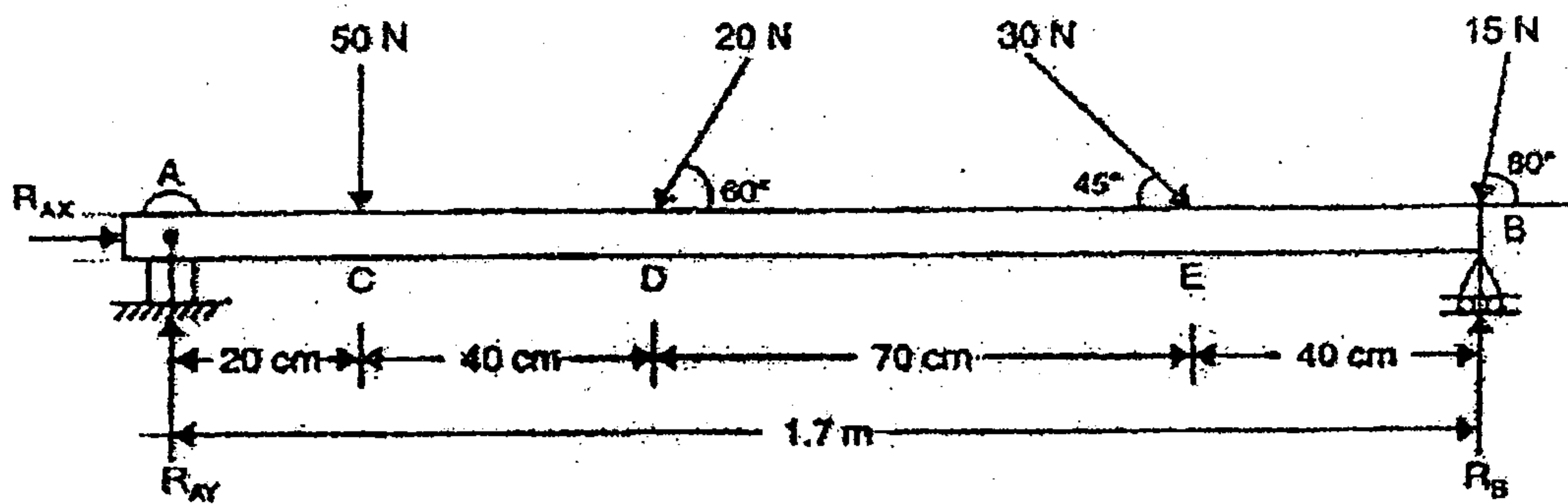


Fig.11(b)

12. (a) A simply supported beam of length 5 m carries a uniformly increasing load of 800 N/m at one end to 1600 N/m at the other end. Calculate the reaction at both ends. (16)

Or

- (b) A beam AB 1.7 m long is loaded as shown below. Determine the reaction at A and B. (16)



13. (a) A uniform ladder of length 10 m and weighing 20 N is placed against a smooth vertical wall with its lower end 8 m from the wall. In this position the ladder is just to slip. Determine the coefficient of friction between the ladder and the floor, and the frictional force acting on the ladder at the point of contact between ladder and floor.

Or

- (b) An effort of 200 N is required just to move a certain body up an inclined plane of angle 15° , the force acting parallel to the plane. If the angle of inclination of the plane is made 20° , the effort required, again applied parallel to the plane, is found to be 230 N. Find the weight of the body and the coefficient of friction.
14. (a) (i) A car is moving with a velocity of 20 m/sec. The car is brought to rest by applying brakes in 4 sec. Determine (1) the retardation and (2) distance travelled by the car after applying brakes. (6)
- (ii) A stone dropped into well is heard to strike the water after 4 sec. Find the depth of the well if the velocity of the sound is 350 m/sec. (10)

Or

- (b) (i) What is the smallest radius which should be used for a high way curve if the normal component of the accelerations of a car traveling at 72 kmph is not to exceed 0.72 m/sec^2 ? (6)
- (ii) A cricket ball, shot by a batsman from a height of 1.8 m at an angle of 30° with horizontal with a velocity of 18 m/sec. is caught by a field man at a height of 0.6 m from the ground. How far apart were the two players? (10)
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.

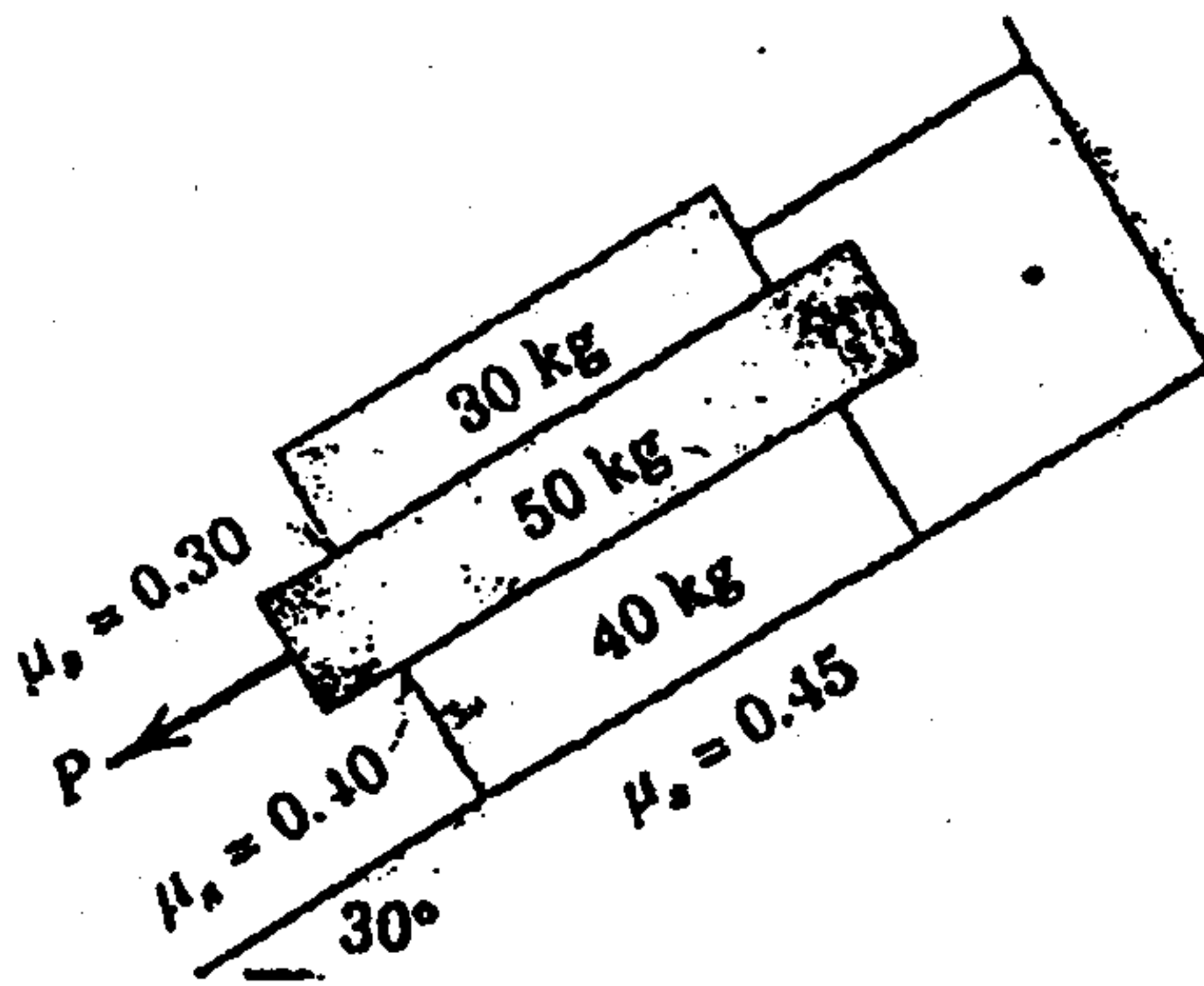


Fig.15a

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.

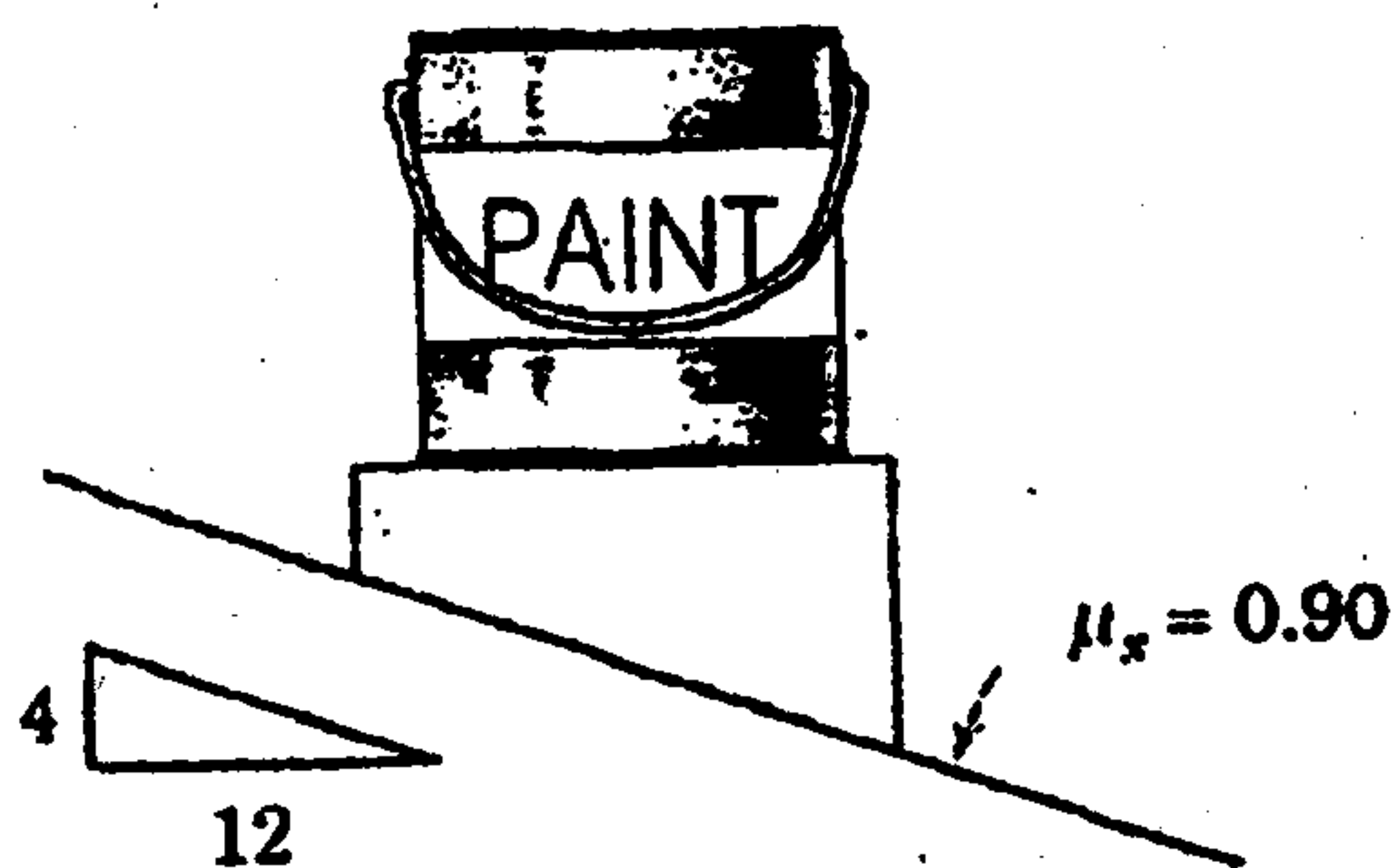


Fig.15b