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Question Paper Code : 13017

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Second Semester

Civil Engineering

GE 204 — ENGINEERING MECHANICS

(Common to All branches)

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the magnitude of the resultant of a force 80 N at 50° and a force 60N at 120° .
2. State the principle of transmissibility.
3. State the different types of supports.
4. Write the equations of equilibrium of a rigid body in three dimension.
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 ball is shot vertically upwards with a velocity of 16.5 m/s. Find the maximum height reached by the ball.
8. Define coefficient of restitution.
9. Give two examples of general plane motion.
10. A body is rotating with an initial angular velocity of 3 rad/s. Its angular velocity increases to 10 rad/s in 5 seconds. Find the angular acceleration of the body.

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.

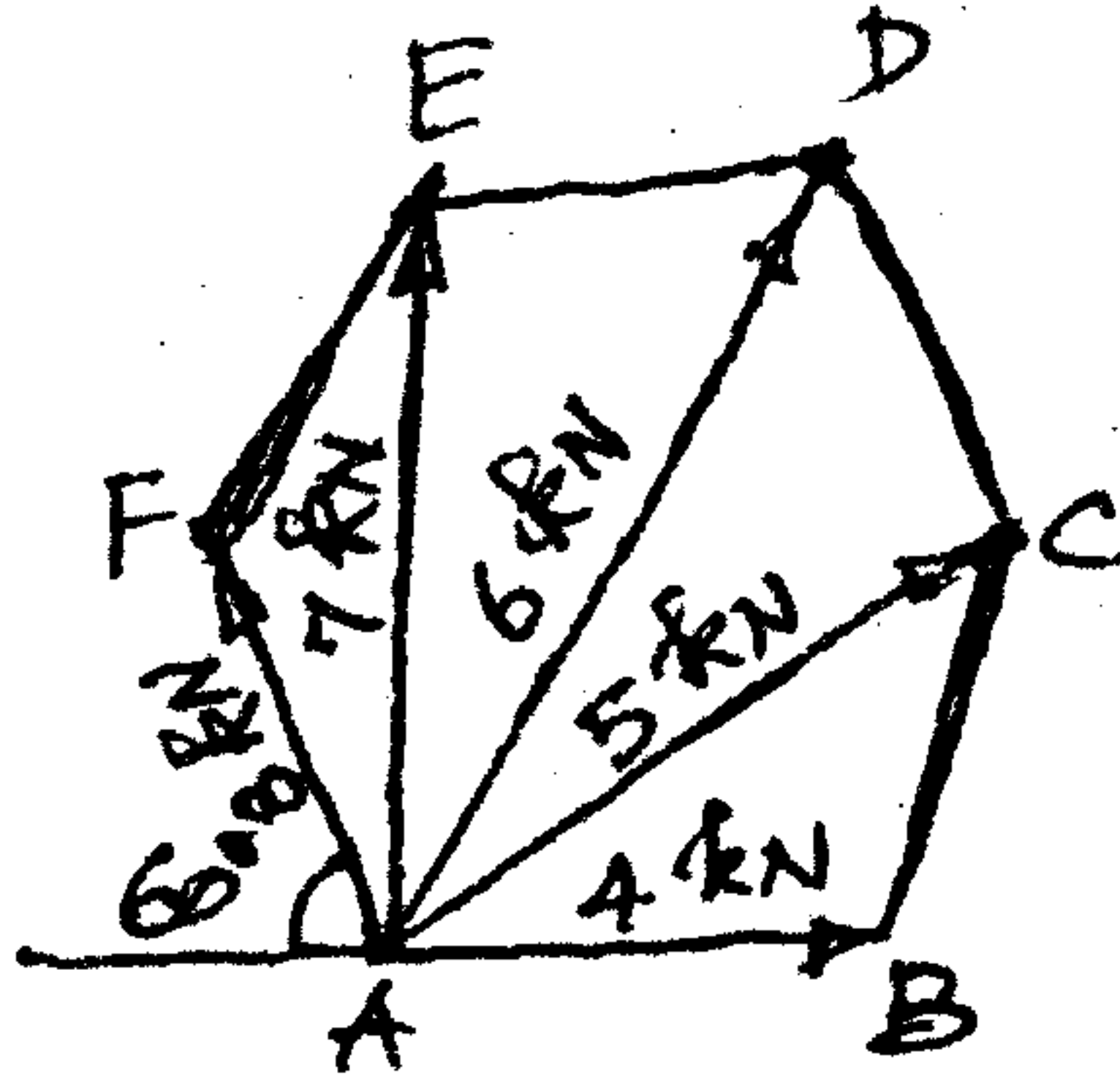


Fig. 11(a).

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.

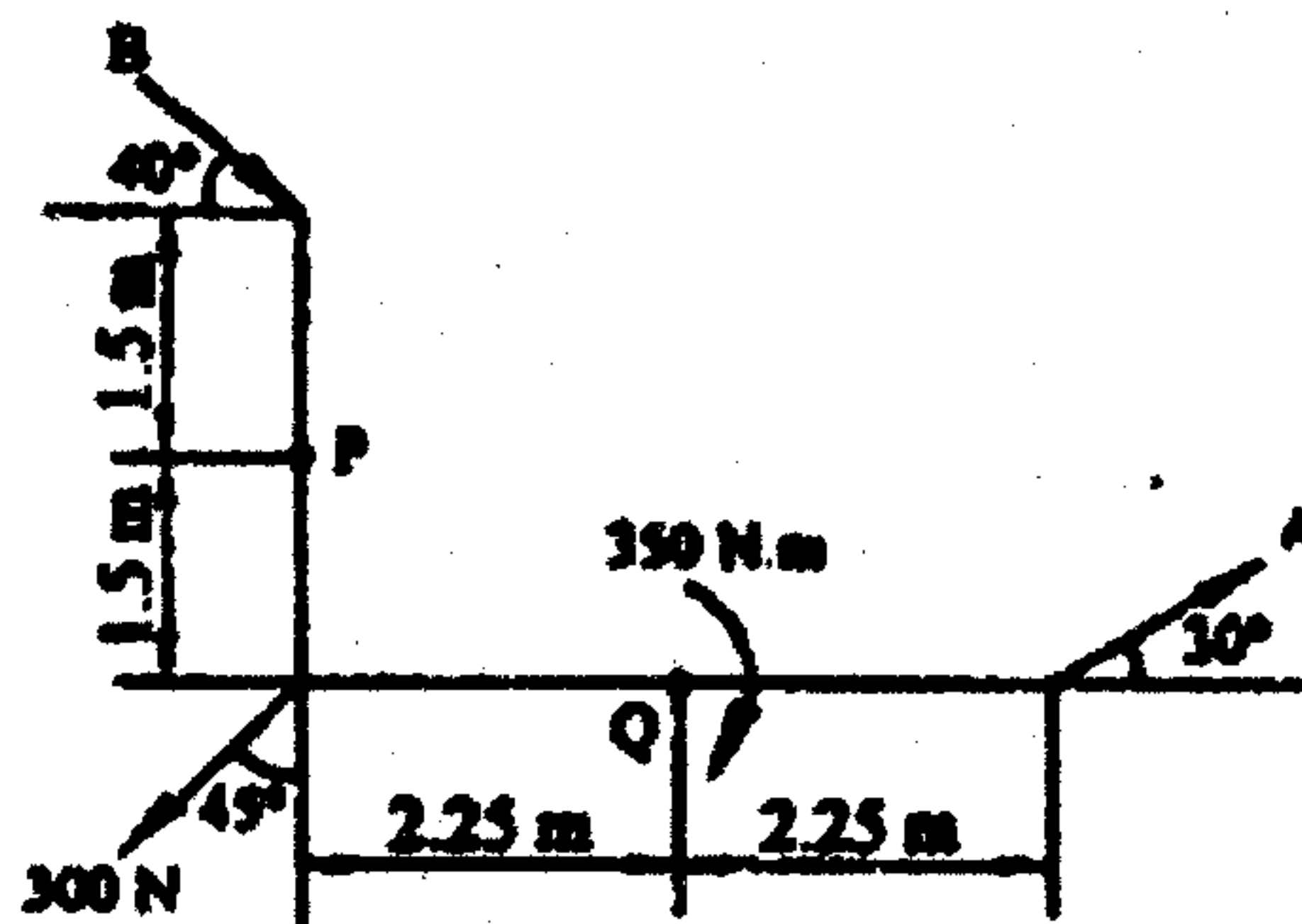


Fig. 11(b)

12. (a) Three links PQ, QR and RS connected as shown in Fig. 12(a) support loads W and 50N. Find the weight W and the force in each link if the system remains in equilibrium.

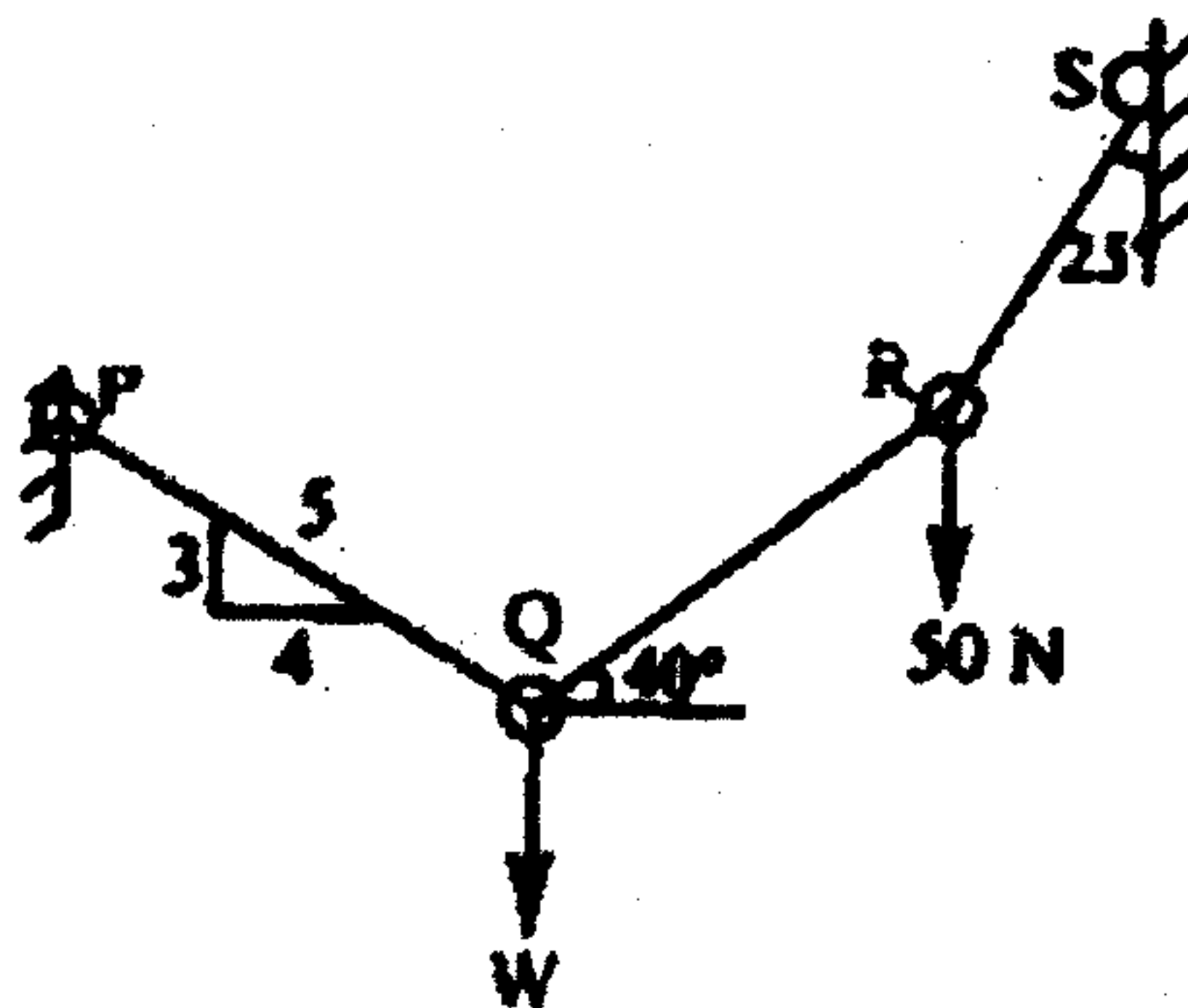


Fig. 12(a)

Or

- (b) Find the support reactions of the beam loaded as shown in Fig. 12(b).

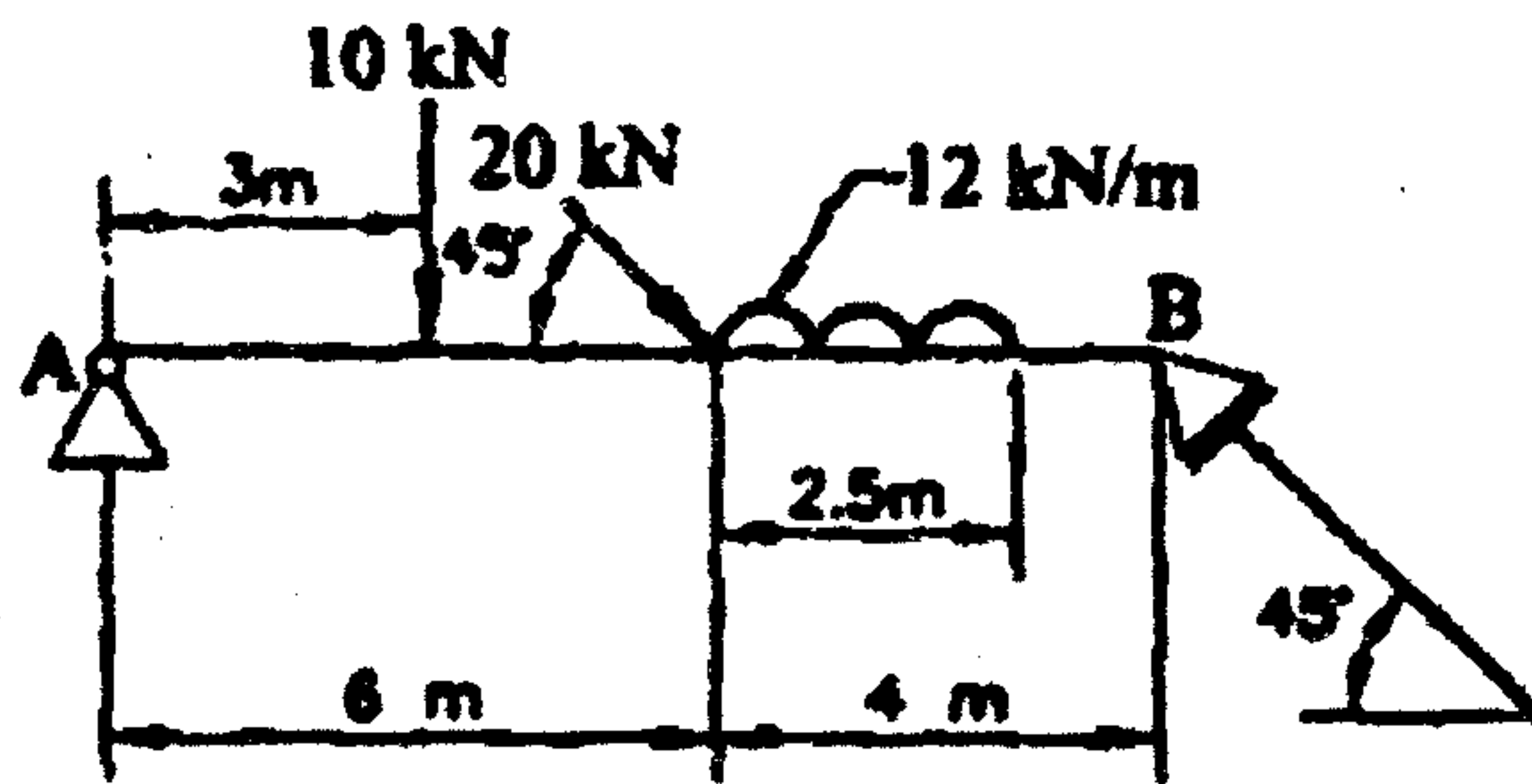


Fig. 12(b)

13. (a) Locate the centroid of the shaded area shown in Fig. 13(a). The dimensions are in mm.

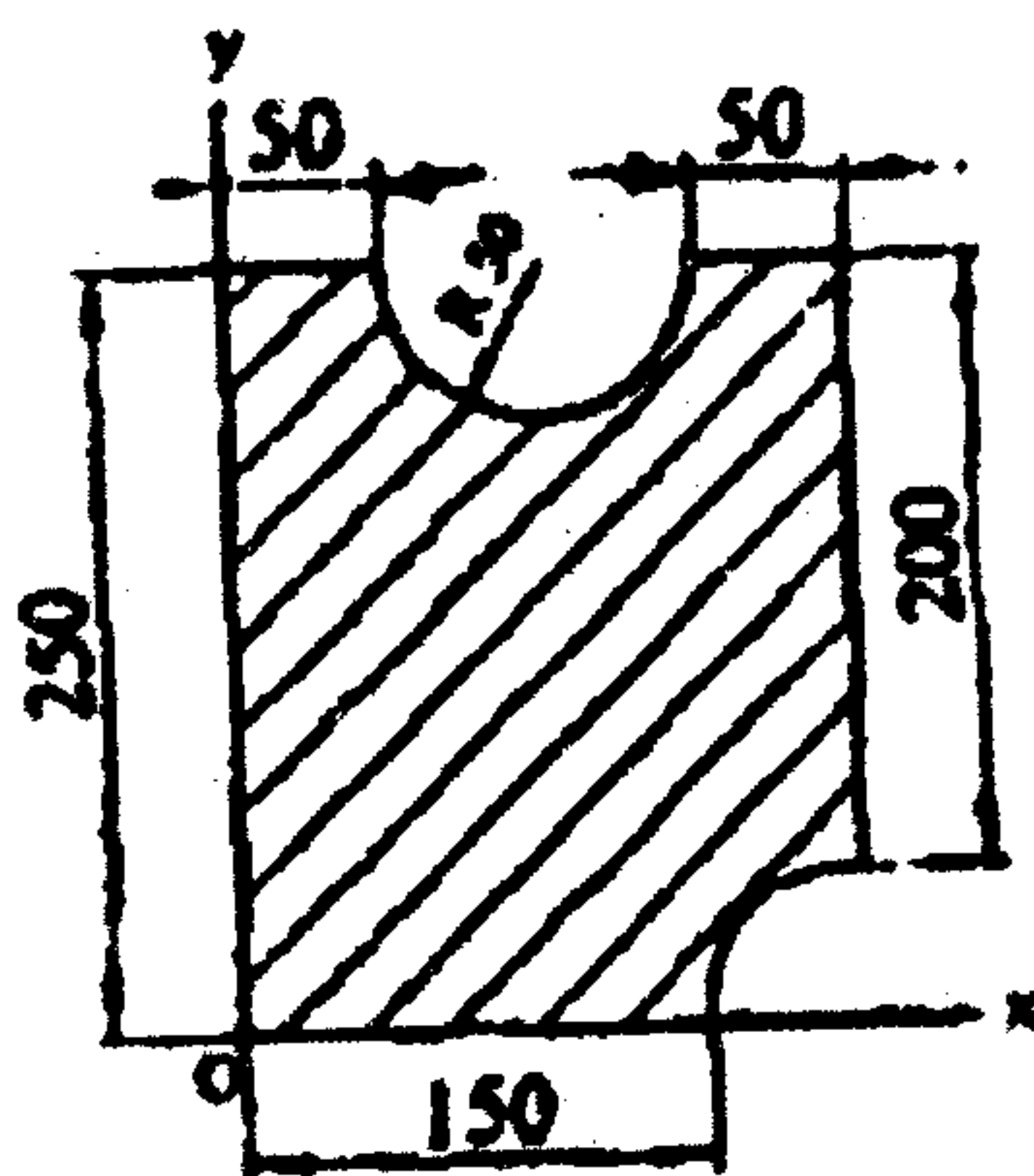


Fig. 13(a)

Or

- (b) Find the moment of inertia of the hatched portion shown in Fig. 13(b) about Ox and Oy.

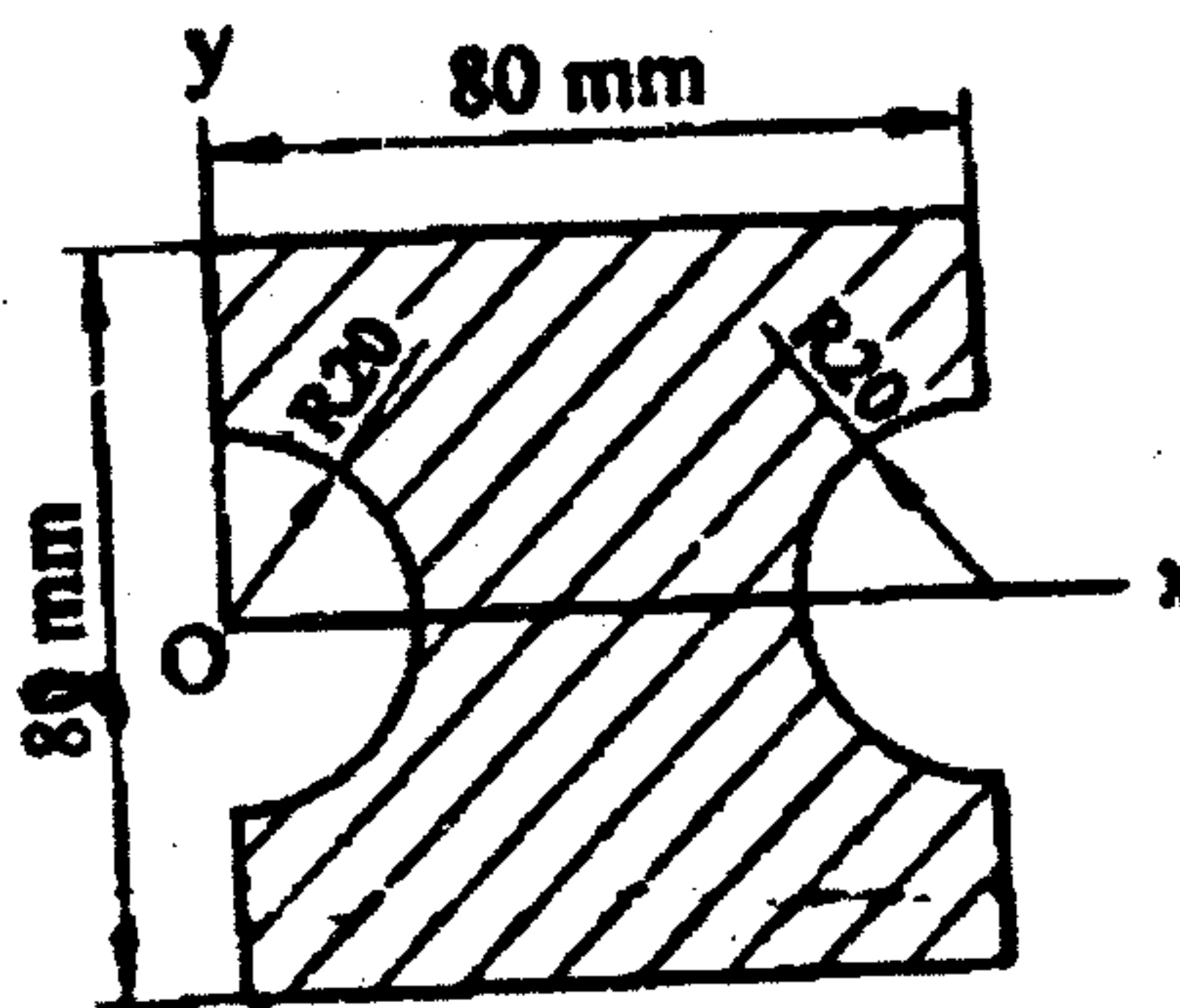


Fig. 13(b)

14. (a) The motion of a particle is described in the form of an equation $a = 5t^2 - 3t + 2$ where a is acceleration in m/s^2 and t , time in seconds. The velocity is 10 m/s at $t = 3$ seconds. The distance travelled is 14 m at $t = 2$ s. Find (i) the velocity of the particle after 6 seconds and (ii) the distance travelled after 4 seconds.

Or

- (b) A block and pulley system is shown in Fig. 14(b). The coefficient of kinetic friction between the block and the plane is 0.2. The pulley is frictionless. Find the acceleration of the blocks and the tension in the string when the system is just released. Also find the time required for the 120 kg block to come down by 3m.

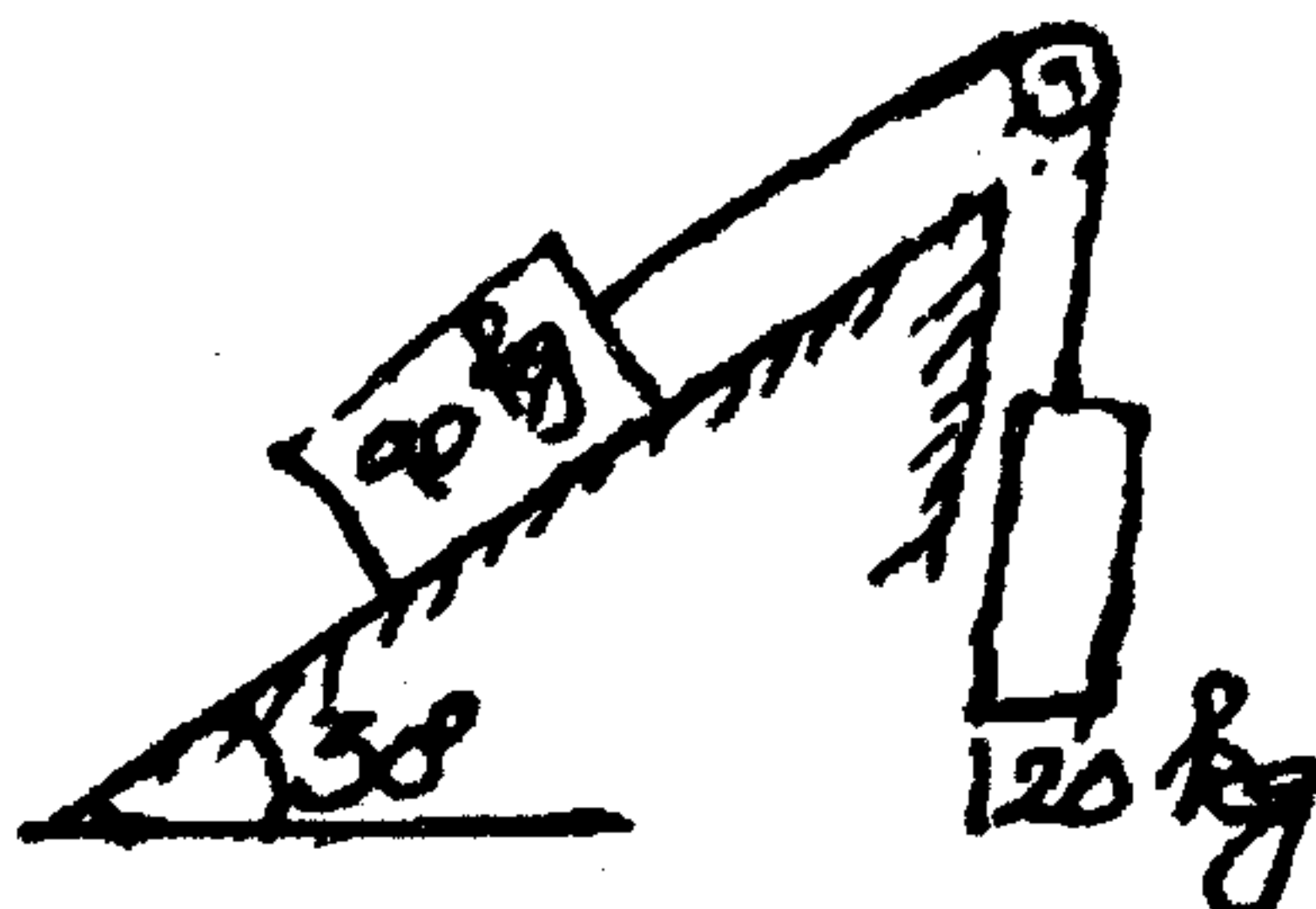


Fig. 14(b)

15. (a) Two blocks of weight 500 N and 900 N connected by a tie rod are kept on an inclined plane as shown in Fig. 15(a). The tie rod is parallel to the plane. The coefficient of friction between 500 N block and the plane is 0.3 and that between 900 N block and the plane is 0.4. Find the inclination of the plane with the horizontal and the tension in the tie-rod when the motion down the plane is just about to start.

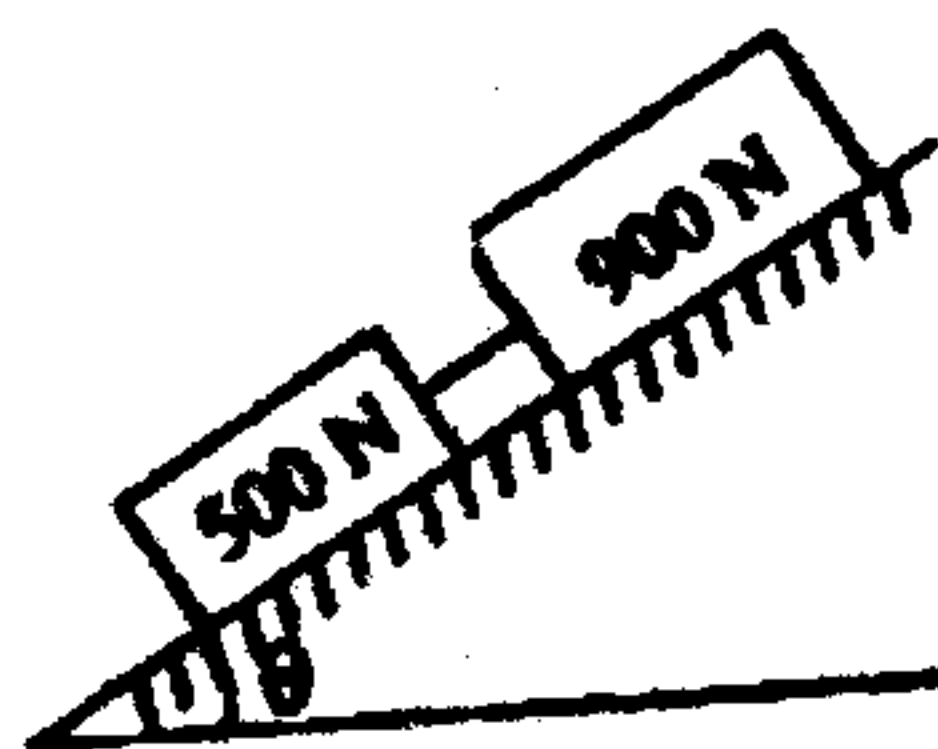


Fig. 15(a)

Or

- (b) A pulley and block system is shown in Fig. 15(b). The cable connecting the two blocks of weight 80 N and 50 N passes over the pulley of weight 40 N having rough surface. Find the acceleration of the blocks and the tension in the cable.

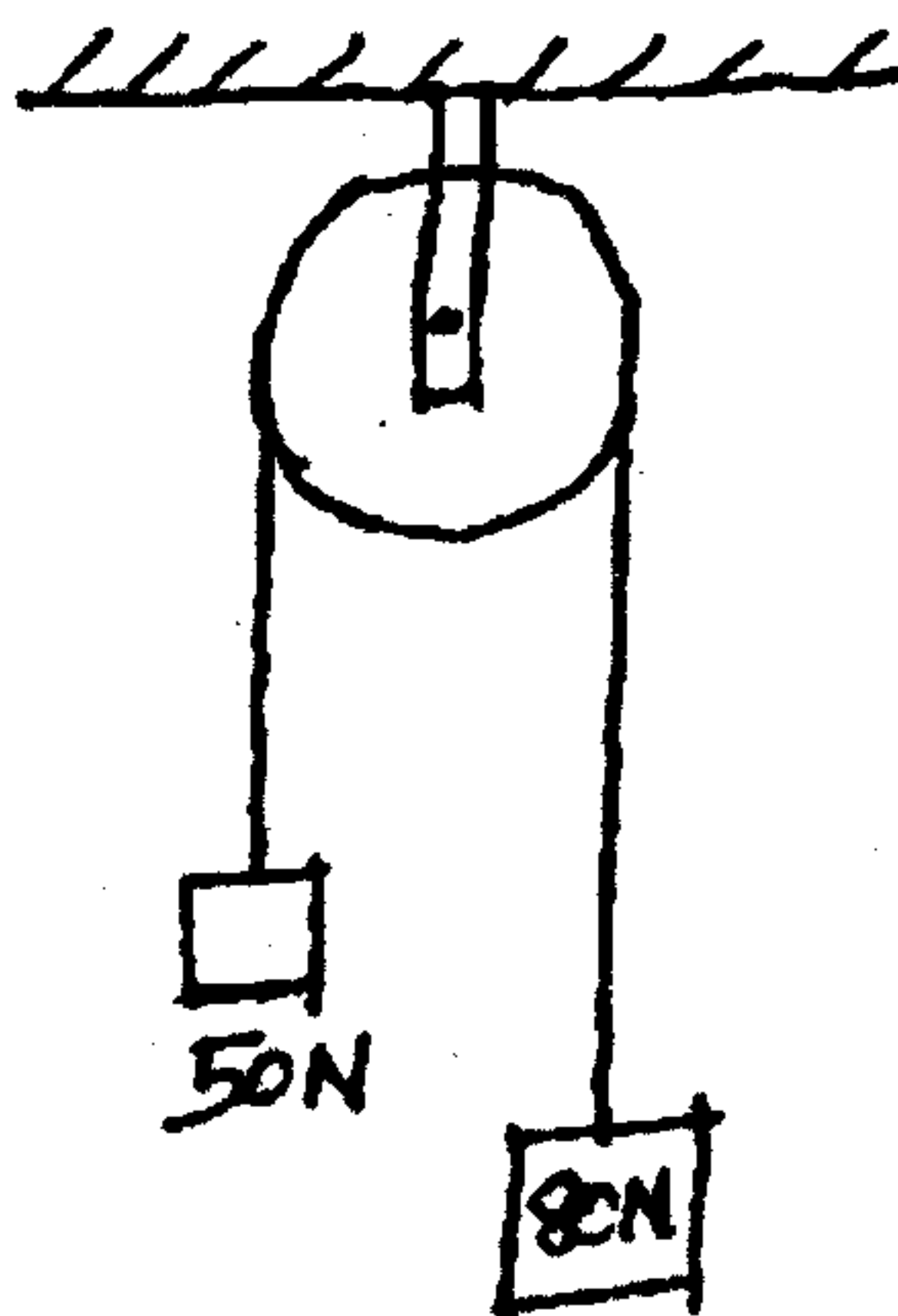


Fig. 15(b)