



PART B — (5 × 16 = 80 marks)

11. (a) A beam is loaded as shown in Fig. 11 (a). Find the magnitude, direction and the location of the resultant of the system of forces.

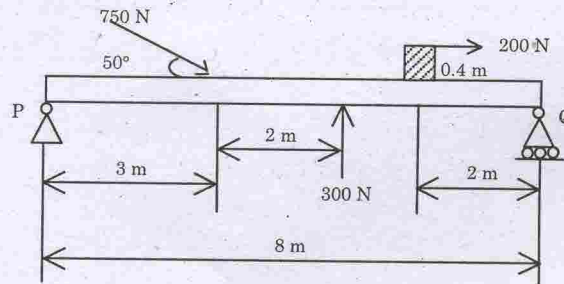


Fig. 11(a)

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.

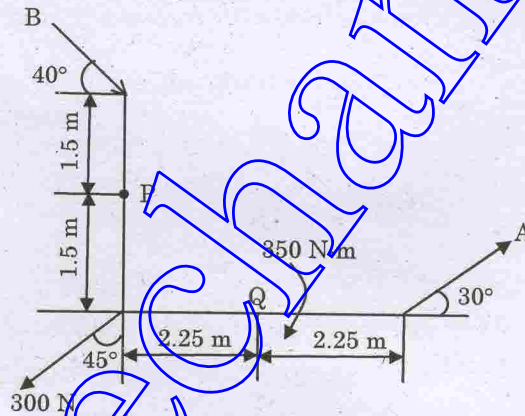


Fig. 11(b)

12. (a) Two identical rollers each of weight 2.5 kN rest in between an inclined wall and a vertical wall as shown in Fig. 12(a). Determine the reactions at the points of contact P, Q and R. Assume the wall surfaces to be smooth.

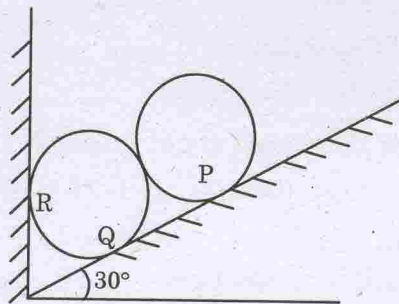


Fig. 12(a)

Or

- (b) Determine the support reactions of the simply supported beam shown in Fig. 12 (b).

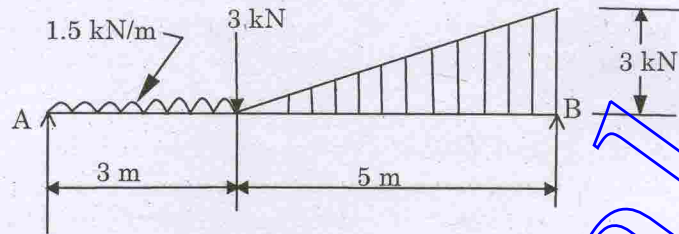


Fig.12(b)

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

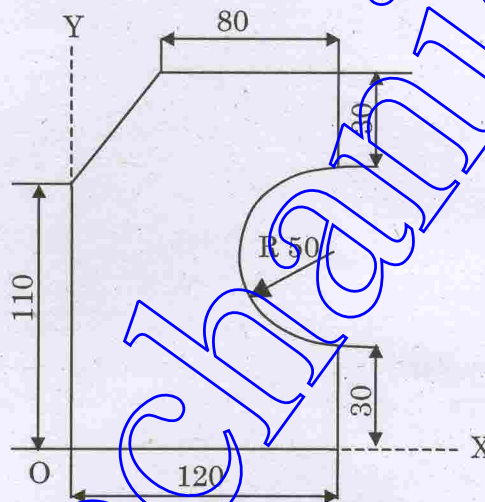


Fig. 13(a)

Or

- (b) Find the moment of inertia of the built up section shown in Fig.13(b) about the axis passing through the centre of gravity parallel to the top flange plate.

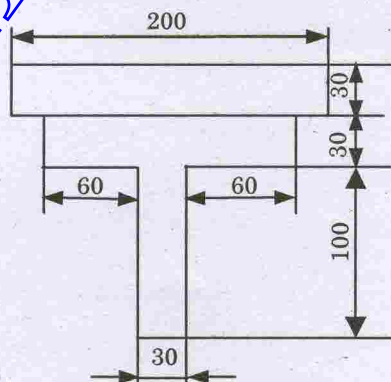


Fig. 13(b)

14. (a) The motion of a particle moving along a straight line is expressed as  $s = t^3 - 8t^2 - 3t + 15$ . Find (i) the time at which the velocity of the particle will be zero. (ii) the distance travelled by the particle at that time (iii) The acceleration of the particle at that time (iv) the net displacement of the particle from  $t = 2$  seconds to  $t = 4$  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 0.25. 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 100 kg block to come down by 2 m.

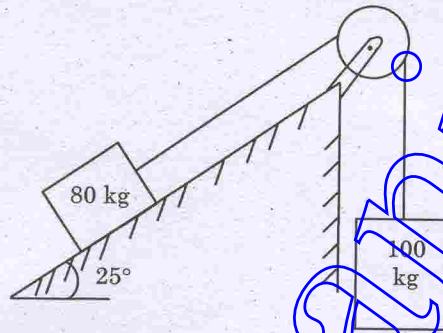


Fig. 14(b)

15. (a) A pull of 250N inclined at  $25^\circ$  to the horizontal plane is required just to move a body kept on a rough horizontal plane. But the push required just to move the body is 300 N. If the push is inclined at  $25^\circ$  to the horizontal, find the weight of the body and the coefficient of friction between the body and the plane.

Or

- (b) Two wheel rims P and Q weighing 90N and 150 N respectively are released from rest to roll down an inclined plane simultaneously. The plane is inclined at  $30^\circ$  to the horizontal. The external radii of the rims P and Q are 80 mm and 120 mm respectively. Their radii of gyration are 100 mm and 120 mm respectively. Assuming rolling with slipping, find the relative acceleration of P with respect to Q parallel to the plane. Also find the velocity of P after 4 seconds.