

PART B — (5 × 16 = 80 marks)

11. (a) (i) Four coplanar forces are acting at a point. Three forces have magnitude of 20 N, 50 N and 20 N at angles of 45°, 200° and 270° respectively with respect to +x axis. Fourth force is unknown. Resultant force has a magnitude of 50 N and acts along x-axis at an angle of 0° with respect to +x axis. Determine the unknown force and its direction or angle from +x-axis. (8)
- (ii) A lamp of mass 1 kg is hung from the ceiling by a chain and is pulled aside by a horizontal chord until the chain makes an angle of 60° with the ceiling. Find the tension in the chain and chord. (8)

Or

- (b) A 200 kg cylinder is hung by means of two cables AB and AC, which are attached to the top of a wall. A horizontal force P perpendicular to the wall holds the cylinder in the position shown. Determine the magnitude of P and the tension in each cable. (16)

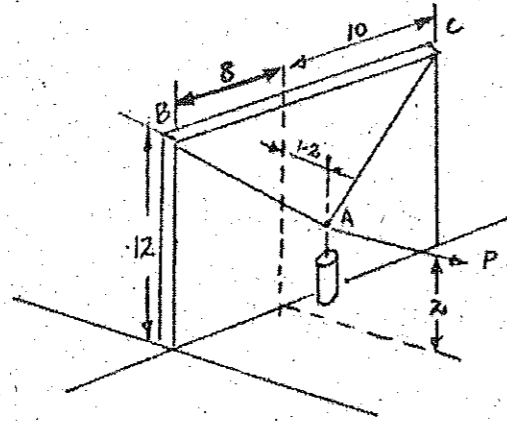


Fig. 11(b)

12. (a) (i) A bar ABCD is hinged at A and supported by a cable, at BC, passing over a frictionless pulley at P above it. Determine the tension in the cable and the reaction at A for a load of 500 N hanging at D. (8)

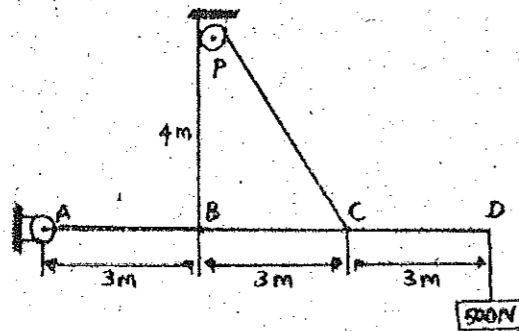


Fig. 12(a)(i)

- (ii) Three forces are applied to an angle bracket as shown in Fig. 12(a)(ii). Determine the magnitude and direction of the resultant and the distance from 'O' to the line of action of the resultant. (8)

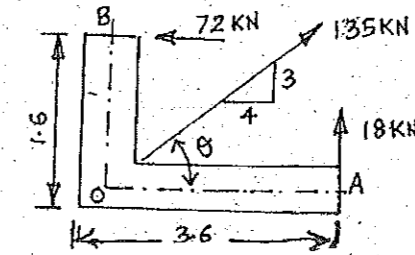


Fig. 12(a)(ii)

Or

- (b) The boom of a crane is shown in Fig. 12(b). If the weight of the boom is negligible compared with the load $W = 60$ kN, find the compression in the boom and also the limiting value of the tension T when the boom approaches the vertical position. (16)

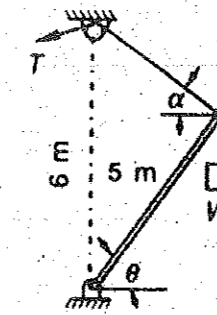


Fig. 12(b)

13. (a) Determine the polar moment of inertia about centroidal axis of the I-section shown in the Fig. 13(a). Also determine the radii of gyration with respect to x-x and y-y axis. (16)

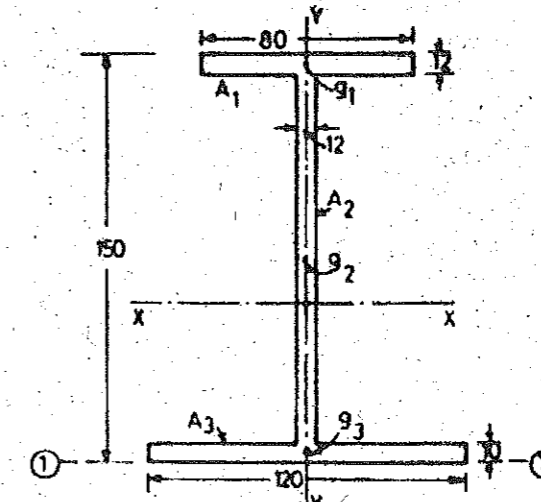


Fig. 13(a)

Or