

Fig. 1

Fig. 1 shows the cross-section of a solid cylinder through which a cylindrical hole has been drilled to make a uniform prism. The radius of the cylinder is $5r$ and the radius of the hole is r . The centre of the hole is a distance $2r$ from the centre of the cylinder.

- (i) Find, in terms of r , the distance of the centre of mass of the prism from the centre of the cylinder. [4]

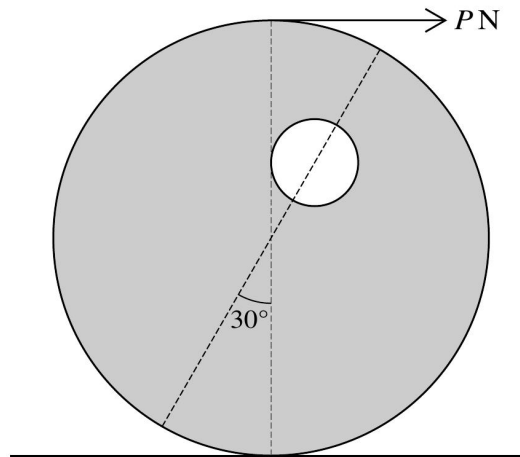


Fig. 2

The prism has weight WN and is placed with its curved surface on a rough horizontal plane. The axis of symmetry of the cross-section makes an angle of 30° with the vertical. A horizontal force of magnitude PN acting in the plane of the cross-section through the centre of mass is applied to the cylinder at the highest point of this cross-section (see Fig. 2). The prism rests in limiting equilibrium.

- (ii) Find the coefficient of friction between the prism and the plane. [4]

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