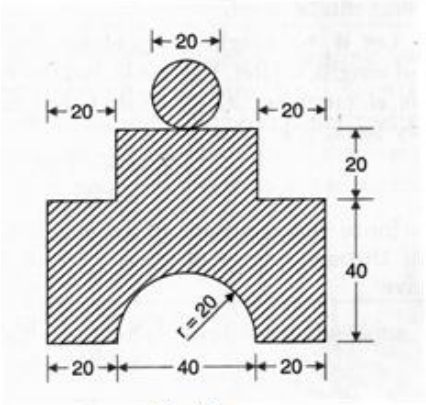


**Fig.5**

13 Determine the force P required to move the wedge downwards as shown in Fig.6. (10)
Angle of friction is $15^o$ for all the surfaces.

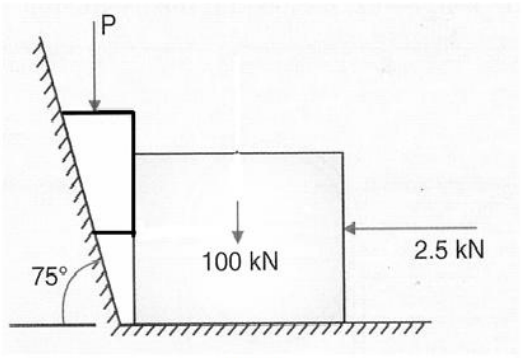


**Fig.6**

14 a) State thetheorems of Pappus and Guldinus. Illustrate it with the determination of (5)
(a) surface area of a cylinder ( Radius R and Length L) (b) Volume of a sphere of radius R.

b) Determine the support reactions for the beam shown inFig.7by applying principle (5)
of virtual work.

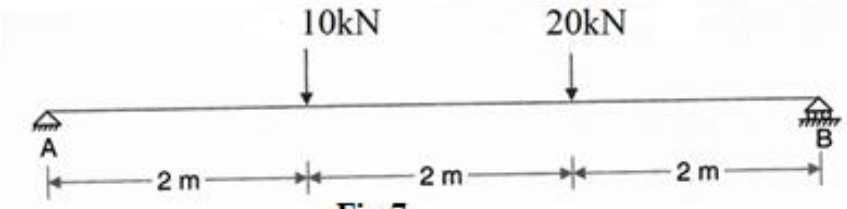


**Fig.7**

**SET III**

15 a) State D'Alembert principle giving the equation. (3)

b) In a crank and connecting rod mechanismshown in Fig.8, the radius of the crank is 300mm and the length of the rod is 1500mm. The crank is rotating at 300rpm. Determine the following, when the crank makes an angle $40^0$ as shown in Fig.8: (7)

i) Velocity at point **A** ii) Angular velocity of the rod **AC**

iii) The velocity of the piston at **C.**

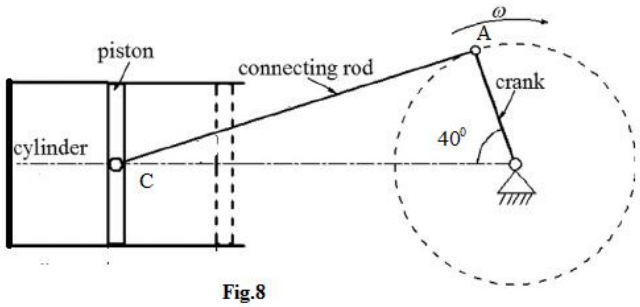


**Fig.8**

16 A lift has an upward acceleration of $1m/s^2$. Find the pressure exerted by the man of 62.5kg on the floor of the lift. If the lift had a downward acceleration of $1m/s^2$, find the pressure exerted by the man. Also find an upward acceleration of the lift, which would cause the man to exert a pressure of 700N. (10)

17 A body of mass 500kg is suspended by two springs in series, the stiffness of springs being 60kN/m and 40kN/m. The body is pulled down from its equilibrium position by 50mm and released. What will be the maximum acceleration and maximum velocity of the body? What would be the maximum acceleration, if the springs were in parallel? (10)

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