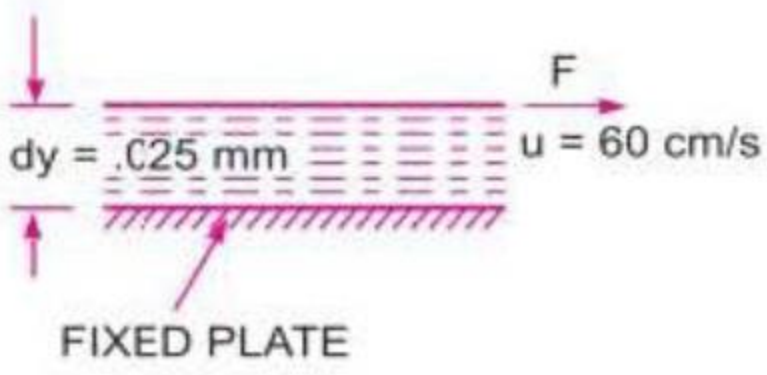
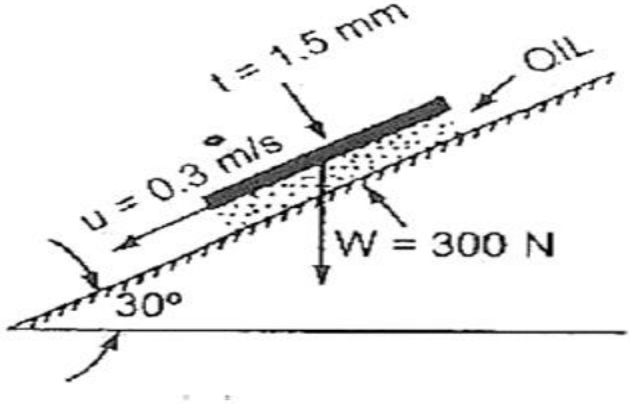
Sheet (1)

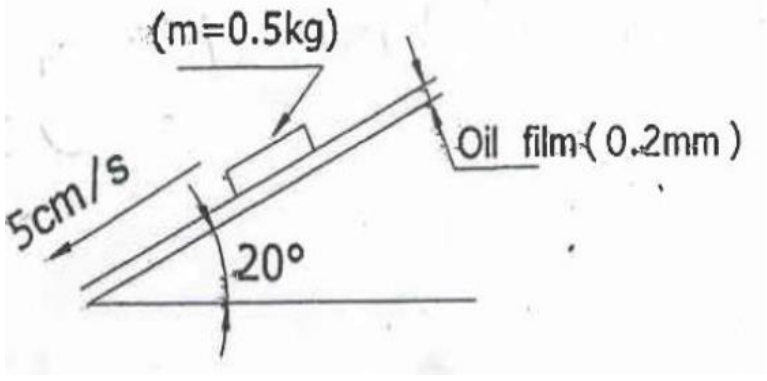
1- **Calculate the specific weight, density and specific gravity of one litre of a liquid which weighs 7N.**
2- **Calculate the density, specific weight and weight of one litre of petrol of specific gravity = 0.7**
3- **A plate 0.025 mm distant from a fixed plate, moves at 60 cm/s and requires a force of 2 N per unit area i.e., 2 N/m^2 to maintain this speed. Determine the fluid viscosity between the plates.**



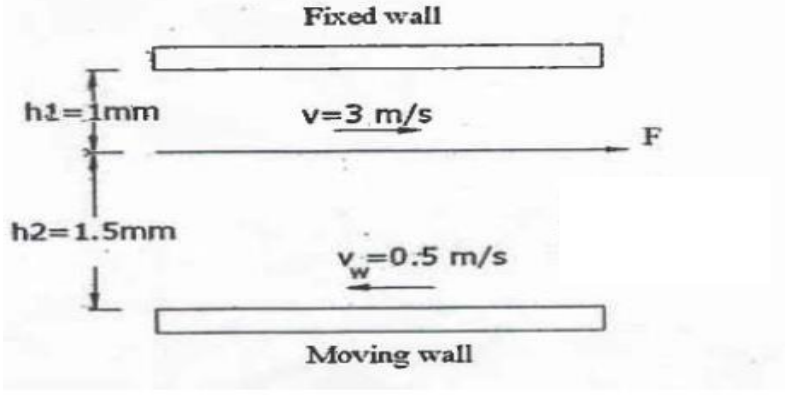
4- **Calculate the dynamic viscosity of an oil, which is used for lubrication between a square plate of size 0.8 m x 0.8 m and an inclined plane with angle of inclination 30° as shown in Fig. The weight of the square plate is 300 N and it slides down the inclined plane with a uniform velocity of 0.3 m/s. The thickness of oil film is 1.5 mm.**



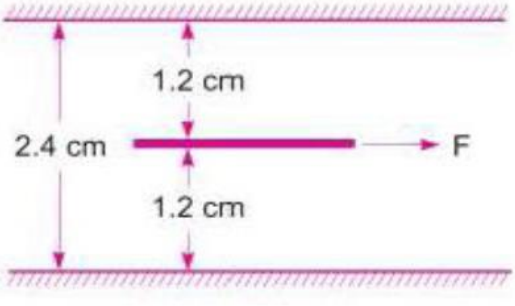
5- **Find the viscosity of oil in poise and pa.s. if the plate (0.6mx0.6m) as shown in figure slides down the plane with a velocity of 5 cm/sec. find the kinematic viscosity in Stokes and m^2/sec. If the specific gravity is 0.8.**



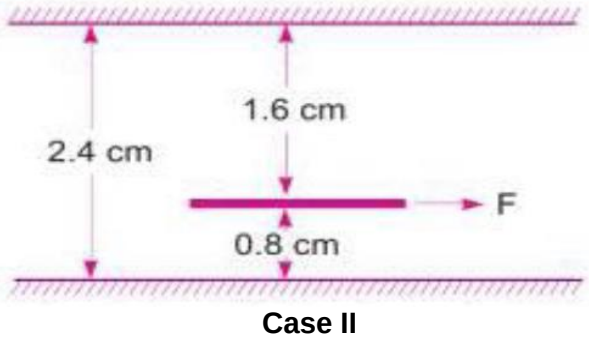
6- A thin flat plate (40cmx40cm) is pulled horizontally at 3m/sec between two parallel plates, one stationary and the other moving at a velocity of 0.5m/sec. Determine the force and the power required to maintain the plate in motion. Sketch the velocity profile (μoil=2.7 $poise$).



7- Two large plane surfaces are 2.4 cm apart. The space between the surfaces is filled with glycerin. What force is required to drag a very thin plate of surface area 0.5 square meter between the two large plane surfaces at a speed of 0.6 m/s, if:
(i) The thin plate is in the middle of the two plane surfaces, and
(ii) The thin plate is at a distance of 0.8 cm from one of the plane surfaces? Take the dynamic viscosity of glycerin = 8.10 x 10^{-1} N s/m^2.



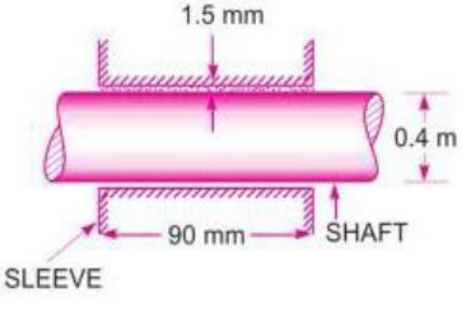
Case I



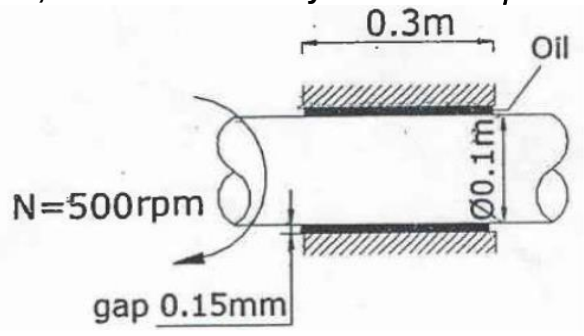
Case II

8- A plate 0.5mm thick is moving vertically downward under its own weight between two parallel plates filled with oil in between. The plate area is 1m^2. The oil has viscosity of 0.15kg/m.sec. The plates moves with uniform velocity of 0.4 m/sec. at equal distances from each of the fixed plates. The fixed plates are 2.5mm apart. Evaluate the weight of the plate.

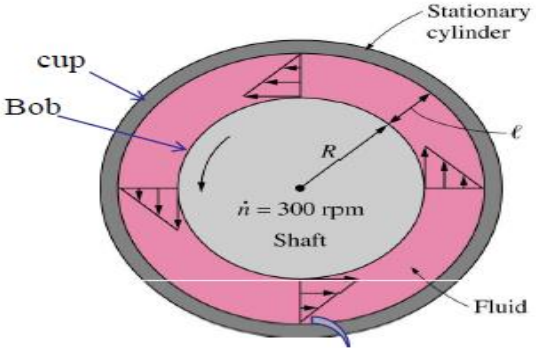
9- The dynamic viscosity of an oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m and rotates at 190 r.p.m. Calculate the power lost in the Bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.5 mm.



10- What is the torque and the power required for the shaft shown in figure to rotate at a speed of 500 rpm (oil grade, kinematic viscosity = 3.2St. and ρ=760 kg/m^3)

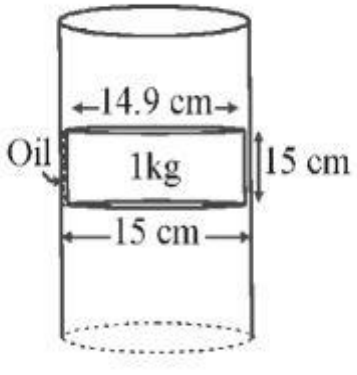


11- The viscosity of the fluid is to be measured by rotating viscometer consisting of two concentric cylinders 40 cm long. See fig. , the inner cylinder is 15 cm in diameter and rotates at 300 rpm, and the gap is 0.15 cm. The torque is measured to be 2 N.m. Determine the viscosity.

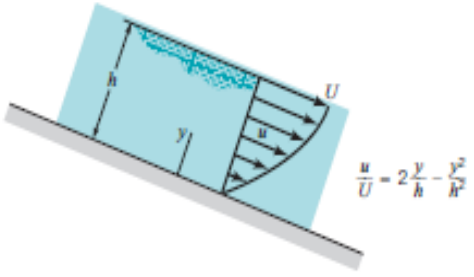


12- If the velocity distribution in a circular pipe of radius R is given by u= U_{max} ($1-r^2/R^2$) where r is the radial distance from center and U_{max} is the maximum flow velocity at the center, find the drag force on a section of pipe 20cm long , 12cm diameter. Use U_{max}=3m/s and μ=0.011 poise. Sketch the velocity distribution

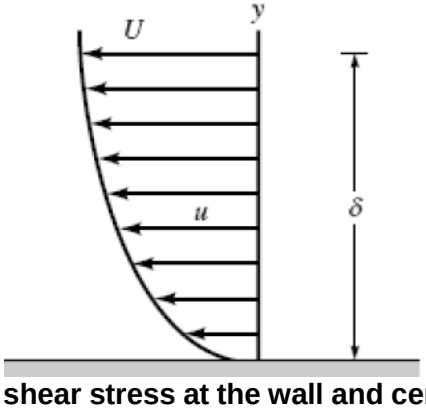
13- A sliding fit cylindrical body of 1 kg mass drops vertically down at a constant velocity 5 cm/sec. Estimate the viscosity of the oil.



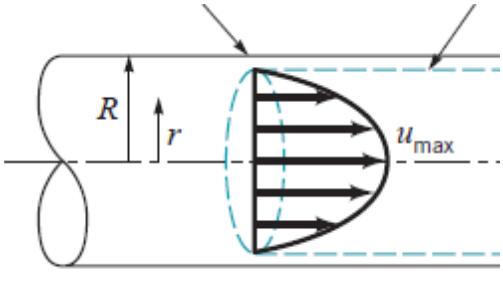
14- A layer of water flows down an inclined fixed surface with the velocity profile given in figure. Determine the magnitude and the direction of the shear stress that water exerts on the fixed surface for U=0.3m/s, h=0.1m,v=1∗10^{-6} m^2/s.



15- A Newtonian fluid (S.G. = 0.9) and (v = 4 Stokes) flows past a flat plate. Determine the magnitude and direction of wall shear stress if U = 1 m/s and δ = 10 mm. What is the shear stress at y=δ. $\frac{u}{U} = sin\left(\frac{\pi}{2}\frac{y}{\delta}\right)$



16- For the flow given, find the shear stress at the wall and centerline, when U_{max} = 4 m/s, R =10 cm and μ = 1.5 $Pa.s$



$$u_1 = u_{max}\left[1 - \left(\frac{r}{R}\right)^2\right]$$

17- When a 2-mm-diameter tube is inserted into a liquid in an open tank, the liquid is observed to rise 10 mm above the free surface of the liquid. The contact angle between the liquid and the tube is zero, and the specific weight of the liquid is 1.2×10^4 N/m^3. Determine the value of the surface tension for this liquid.