

Assignment-1

Note: 1- Due date for the submission is 3rd sept-2010 upto 5:00 PM only.

2-Copying the assignment is strictly prohibited.

3-failing to comply with the note will lead to zero marks in the assignment.

- 1) Two large vertical plates parallel to each other are 2mm apart. A thin flat plate of 1 mm thickness, 0.6 m*0.6 m size and 25 N weight is towed vertically up b/w the two large plates with a velocity of 0.2 m/s. the inside plate is equidistant from the two stationary plates. The gap b/w the large plates is filled with oil of viscosity 1.6 poise. Calculate the vertical force required to tow vertically upward.
- 2) A shaft of 0.4m diameter rotates at a speed of 300 rpm. An oil of viscosity 5 poise is used for lubrication b/w the shaft and sleeve. The thickness of oil film is 1.0 mm and the sleeve length is 100 mm. find the power lost.
- 3) A thin film of liquid flows down an inclined channel. The velocity distribution in the flow is given by

$$u = \frac{1}{2\mu}(h^2 - y^2)\rho g \sin \alpha$$

where, h = depth of flow, α = angle of inclination of the channel to the horizontal, u = velocity at a depth h below the free surface, ρ = density of liquid, μ = dynamic viscosity of the fluid. Calculate the shear stress: (a) at the bottom of the channel (b) at mid-depth and (c) at the free surface. The coordinate y is measured from the free surface along its normal

- 4) For the system shown in Fig.1, determine the air pressure p_A which will make the pressure at N one fourth of that at M.

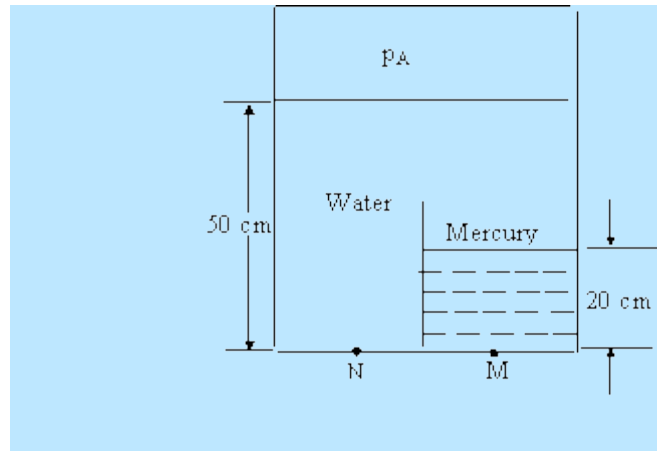


Fig-1

- 5) Consider the pipe and manometer system as shown in Fig 2. The pipe contains water. Find the value of manometer reading h , and the difference in pressure between A and B if there is no flow. If there is a flow from A towards B and the manometer reading is $h = 60$ mm, then determine the static pressure difference $p_A - p_B$

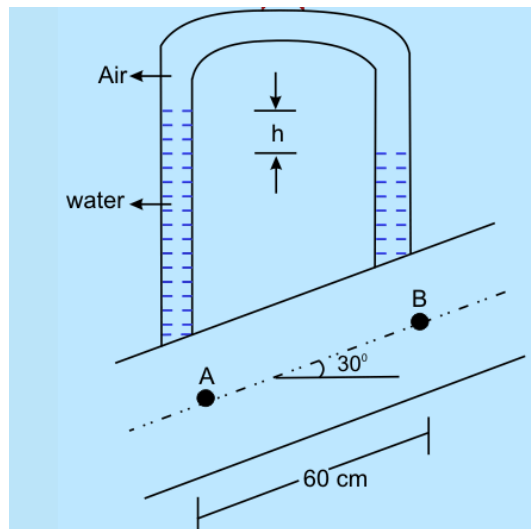


Fig-2

- 6) The fluid flowing in the fig-3 has an absolute viscosity of 0.0010 lb.s/ft^2 and specific gravity of 0.913. calculate the velocity gradient and intensity of shear stress at the boundary and at a

height of 3 inch. From the boundary. Assuming (a) straight line velocity distribution and (b) a parabolic velocity distribution. The parabola in the sketch has its vertex at A and origin at B.

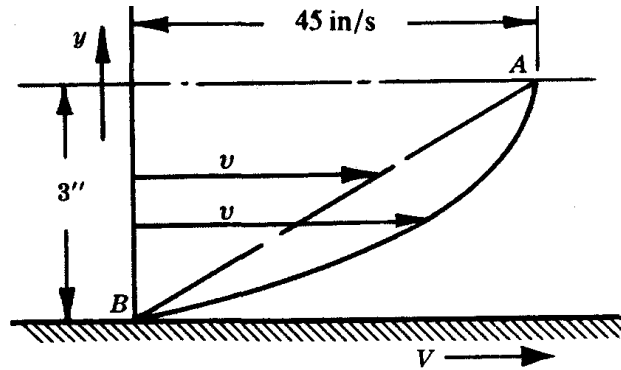


Fig-3

- 7) As shown in fig-4 water flows through pipe A and B. The pressure difference of these two points is to be measured by multiple tube manometers. Oil with specific gravity 0.88 is in the upper portion of inverted U-tube and mercury in the bottom of both bends. Determine the pressure difference.

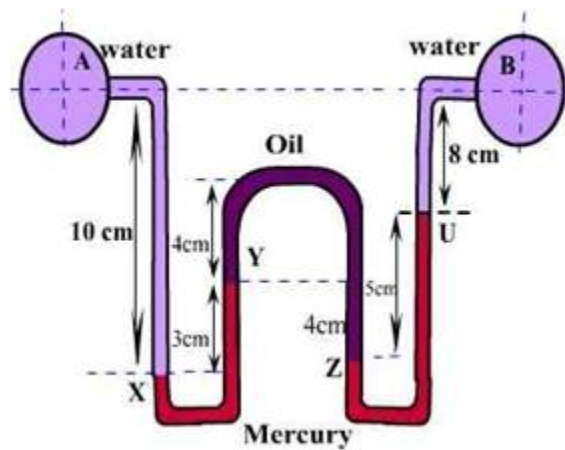


Fig-4

- 8) A force of 460 N is exerted on the lever AB, as shown in the fig-5. End B is connected to a piston which fits into a cylinder having a diameter of 60mm. What force F_d acts on the larger piston, if the volume b/w C & D is filled with water.

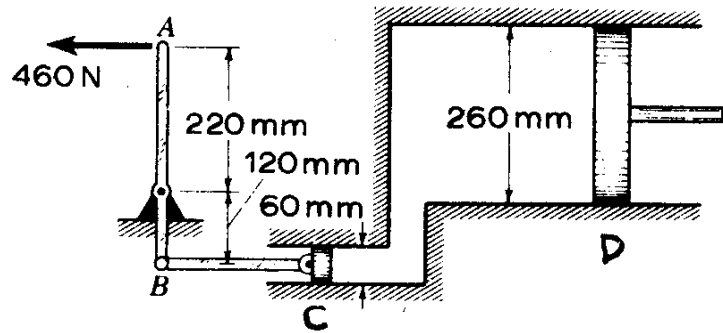


Fig-5

- 9) Find the differences b/w the pressure in the tank A & B, if $d_1=330$ mm, $d_2=160$ mm, $d_3=480$ mm, $d_4=230$ mm with respect to figure-6.

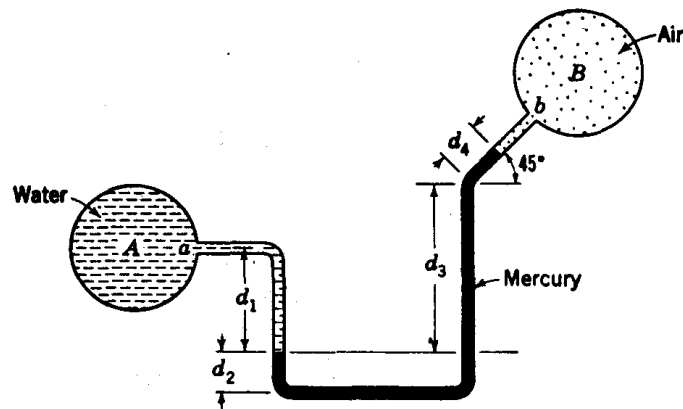


Fig-6

- 10) A: Convert a pressure head of 10 m of water column to kerosene of specific gravity 0.8 and carbon-tetra-chloride of specific gravity of 1.62.

B: Newfound Lake, a freshwater lake near Bristol, New Hampshire, has a maximum depth of 60 m, and the mean atmospheric pressure is 91 kPa. Estimate the absolute pressure and gauge pressure in kPa at this maximum depth. Take specific weight = 9790 N/m^3

