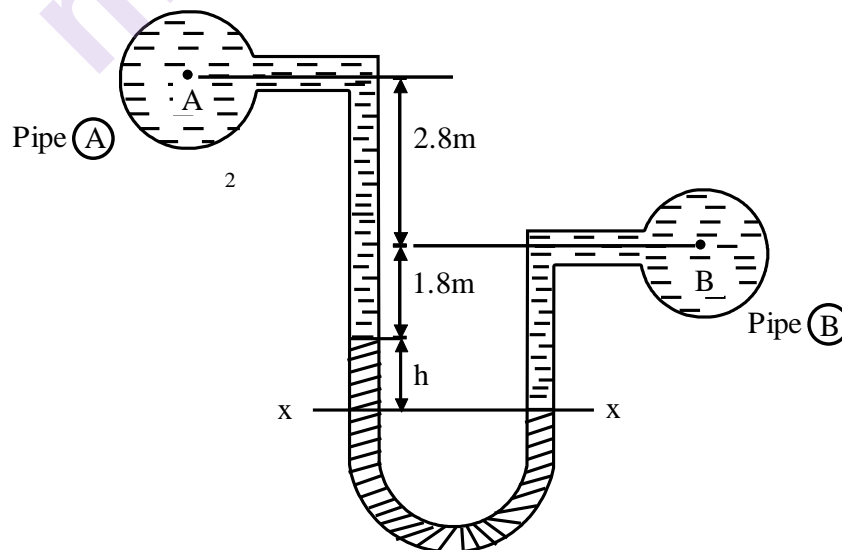




- Notes :
1. All questions carry equal marks.
  2. Due credit will be given to neatness and adequate dimensions.
  3. Assume suitable data wherever necessary.
  4. Illustrate your answers wherever necessary with the help of neat sketches.
  5. Answer **any five** questions.

1. a) Define the following. 4  
 i) Vapour pressure ii) Kinematic viscosity.  
 iii) Capillary depression iv) Dynamic viscosity
- b) If the velocity distribution over a plate is given by  $u = \frac{2}{3}y - y^2$  in which u is the velocity 5  
 in meter per sec. at a distance y meter above the plate, determine the shear stress at  $y = 0$  &  
 $y = 0.15\text{m}$  take dynamic viscosity of fluid as 8.63 poise.
- c) Define surface tension. Prove that the relationship between surface tension & pressure 5  
 inside a droplet of liquid in excess pressure of outside is given by  $\rightarrow p = \frac{4\sigma}{d}$   
 where,  $p$  – pressure in  $\text{N/m}^2$   
 $\sigma$  – surface tension in  $\text{N/m}$   
 $d$  – diameter of droplet in meter
2. a) A differential manometer is connected at two points A & B of two pipes as shown in fig. 8  
 The Pipe A contains a liquid of Sp. gravity 1.2 while pipe B contains a liquid of Sp. gravity 0.8. The pressures at A & B are 1 bar & 1.8 Bar respectively. Find the difference in mercury level in the differential monometer.



- b) A 1m wide & 1.5m deep rectangular plane surface lies in water in such a way that its plane 6  
 makes an angle of  $30^\circ$  with the free surface of water. Determine the total pressure & center  
 of pressure when upper edge is 0.75m below the free surface of water.

3. a) A solid cylinder 4m in diameter & 4m high is floating in water with its axis vertical. If its Sp. gravity is 0.6. Find the metacentric height. Also state whether the equilibrium is stable or not. 8
- b) Explain the terms: 6  
 i) Metacentric height      ii) Meta-centre      iii) Center of buoyancy.
4. a) What is the irrotational velocity field associated with the potential  $\phi = 3x^2 - 3x + 3y^2 + 16t^2 + 12zt$ . Does the flow field satisfy the incompressible continuity equation? 7
- b) A reservoir discharges through a rectangular orifice is 4m below the water level in the reservoir, calculate the discharge through the orifice. The Coeff of discharge of the orifice is 0.62. What would be the percentage error if the orifice were to be treated as a small orifice. 7
5. a) Explain with the help of neat sketch Kinetic energy correction factor & momentum correction factor. 7
- b) State & prove Bernoulli's equation. Also list the assumptions & limitations. 7
6. a) Water flows through a triangular right angle weir first & then over a rectangular weir of 1.1m width. The discharge coeff. of triangular & rectangular weirs are 0.65 & 0.75 respectively. If the depth of water over the triangular weir is 365mm. Calculate the depth of water over the rectangular weir. 8
- b) Find the discharge through a trapezoidal notch which is 1m wide at the top & 0.4m at the bottom & is 0.3m in height. The head of water on the notch is 0.2m. Assume cd for rectangular notch as 0.62 & that for triangular notch as 0.6. 6
7. a) Explain the following terms: 6  
 i) Equivalent pipe.      ii) Syphon.      iii) Major losses in pipes & fittings.
- b) The rate of flow of water through a horizontal pipe of  $0.3\text{m}^3/\text{sec}$ . The diameter of the pipe is suddenly enlarged from 250mm to 500mm. The pr. intensity in the smaller pipe is  $13.734\text{N}/\text{cm}^2$ . Determine → 8  
 i) Loss of head due to sudden enlargement.  
 ii) Pr. intensity in the large pipe  
 iii) Power lost due to enlargement
8. a) Find the displacement thickness, the momentum thickness & energy thickness for the velocity distribution in the boundary layer is given by  $\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$  where 8  
 $\delta \rightarrow$  Boundary layer thickness  
 $U \rightarrow$  free stream velocity  
 $u \rightarrow$  velocity in boundary layer at distance 'y'
- b) Write short notes on **any two**. 6  
 i) Boundary layer separation.      ii) Pitot tube  
 iii) Lift force, Drag force & Resultant force.
- \*\*\*\*\*