

- Q3: A cube of side 100 mm and weight 5 N is immersed in a liquid of relative density 0.80 contained in a rectangular tank of plan area $150 \text{ mm} \times 150 \text{ mm}$. If tank contained liquid to a height of 80 mm before the immersion of cube, determine the levels of bottom of cube and the liquid surface.
- Q4: A horizontal pipe of diameter 100 mm is fitted to a tank containing oil of relative density 0.80. At the end of pipe, a nozzle of diameter 25 mm is fitted. The head acting on the pipe is 4 m. Determine discharge from the nozzle and pressure at the base of nozzle. The energy loss in the pipe can be taken as 20 times the velocity head in pipe and neglecting energy loss in the nozzle.
- Q5: A flow-meter when tested in a laboratory gives a pressure drop of 100 kN/m^2 for a discharge of $0.10 \text{ m}^3/\text{s}$ in a 150 mm diameter pipe. If a geometrically similar model is tested in 600 mm diameter pipe at identical condition of fluid, determine the corresponding discharge and pressure drop in the model.
- Q6: Water flows over a rectangular notch 1 m wide at a depth of 150 mm and afterwards passes through a triangular right-angled notch. The coefficient of discharges for rectangular and triangular notches may be taken as 0.62 and 0.59, respectively. Find depth of water over the triangular notch.

SECTION C

- Q7: Does the stream function, $\psi = 4xy$ describe a possible steady and incompressible flow? If yes, find whether the flow is rotational or irrotational. If irrotational, determine expression for potential function. Further, if flow takes place between the boundaries shown in Figure. Calculate (i) velocity and acceleration at point A and (ii) flow rate across AB.

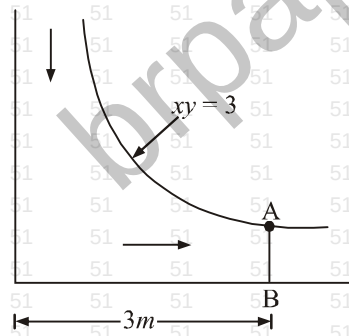


Fig.

- Q8: Two reservoirs 1 and 2 having 15.5 m difference of water levels are connected by a pipeline ABC. The elevation of point B being 4 m below the level of water in reservoir 1. The length AB of the pipeline is 250 m and is made of steel and length BC of pipeline is 450 m and is made of cast iron. The diameter of both pipes is 200 mm. A partially closed valve is located in pipe BC at a distance of 150 m from reservoir 2. If flow through the pipeline is 3000 litres per minute, the pressure head at B is 0.50 m and head loss at the valve is 5 m. Find friction factors of two pipes and draw HGL and TEL.
- Q9: Derive Euler's equation of motion Cartesian coordinates. Hence deduce equation of energy.