3E1625

B.Tech. (Sem.III) (Main/Back) Examination, 2015
Civil Engineering
3CE5 Fluid Mechanics

Time : 3 Hours

Total Marks : 80
Min. Passing Marks : 26

Instructions to Candidates :
Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

UNIT – I

1. (a) Differentiate between :
(i) Real and ideal fluid
(ii) Specific weight and specific volume
(iii) Dynamic and kinematic viscosity
(iv) Compressibility and Bulk Modulus of elesticity. **(8)**

(b) A thin rigid plate of size 1.25 m × 1.25m and weight 149 N slides down a slope of 30° inclination with an equilibrium speed of 8.5 cm/sec. If the slope is coated with a liquid film of thickness 0.75mm, determine the dynamic coefficient of viscosity of the liquid. **(8)**

OR

1. (a) Derive the relationship for capillary size in small size tube. What will happen if tube is having insufficient length. **(8)**

(b) 3.2 m^3 of certain oil weight 27.5 kN. Calculate specific weight, mass density, specific volume and specific gravity with respect to water. If kinematic viscosity of the oil 7×10^{-4} stokes, find its dynamic viscosity in centiporse. **(8)**

UNIT – II

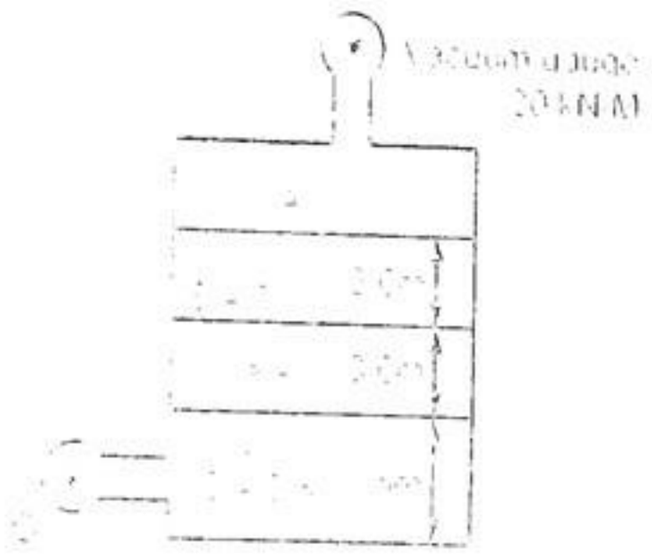
2. (a) State and prove the Pascal's law and give some example where the principle is applied. **(8)**

(b) A vertical square area 1.50m × 1.50m is sub merged in water with upper edge 1.00m below the water surface. Locate the horizontal line on the surface of the square such that the force on the upper portion equals the force on the lower portion. **(8)**

OR

2. (a) Define "Meta centric height".
A wooden block in the form of a rectangular prism floats with its shortest axis vertical. The block is 40 cm long, 20 cm wide and 15 cm deep with a depth of immersion 12 cm. Calculate the position of the meta centre and comments on the stability of the block. **(8)**

(b) Find the gauge reading G in the figure given below.



(8)

UNIT – III

3. (a) Derive continuity equation [illegible] flow. (8)

(b) A 2-D fluid flow is described by [illegible] components [illegible] and [illegible] Evaluate the stream function. Find velocity and acceleration at point [illegible] (8)

OR

3. (a) Define stream lines. What are the important characteristics of stream lines. (4)

(b) Derive Euler's equation of motion along stream line for an ideal fluid flow stating clearly the assumptions. How Bernoulli's equation along a stream line is obtained by integrating this equation. (12)

UNIT – IV

4. (a) How, Pitot tube can be used to find the velocity at a point in a fluid. Explain with figure. (6)

(b) A horizontal venturi meter is provided in a 250mm diameter pipeline conveying water. The throat diameter of the venturi meter is 25 mm. If the pressure in the pipe is 147.15 kPa and the vaccum pressure at the throat is 280 mm of mercury, calculate the rate of flow in the pipe. Assume $C_d = 0.98$. Draw figure also. (10)

OR

4. (a) Justify the statement in a convergent-Divegent mouth-piece, the loss of head is practically eliminated. (6)

(b) A weir 36 meters long is divided into 12 equal bays by vertical posts, each 600 mm wide. Determine the discharge over the weir if the head over the crest is 1.20m and the velocity of approach is 2m/sec. Draw figure also. (10)

UNIT – V

5. (a) Distinguish between

(i) Laminar and Turbulent flow

(ii) Flow theory parallel pipes × pipes in series. (6)

(b) A pipe of diameter 25 cm connects two reservoir. The difference of water levels in two reservoir is 15m. To increase the discharge, another pipeline of same diameter is laid from mid-point of original pipeline to lower reservoir. If length of pipeline is 1600 m and Darcy's f = 0.017, calculate increase in discharge. (10)

5. (a) Explain

(i) Hydraulic gradient line

(ii) Water hammer (6)

(b) Determine the difference in the elevations between the surfaces in the two tanks, connected by a horizontal pipe of diameter 300m and length 450 m. The rate of flow of water through the pipe is 325 lit/sec. Consider all losses and taking Darcy's f = 0.008. Draw h.g.l. also. (10)