PVP 19

Code: 19CE3302

II B.Tech - I Semester – Regular Examinations – MARCH 2021

FLUID MECHANICS
(CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place

PART – A

1. a) State Hydrostatic Law and its applications.
   b) Define
      i) Stream line
      ii) Path line.
   c) Define Lift and Drag.
   d) Differentiate total energy line(T.E.L) and hydraulic gradient line(H.G.L).
   e) How do you measure discharge in Open Channel Flow.

PART – B

UNIT – I

2. a) The diameters of large piston and small piston of a jack are 25 cm and 3 cm respectively. A force of 70 N is applied on the small piston. Find the load lifted by the large piston when the small piston is 40 cm above the large piston. The density of liquid in the jack is given as 1000 kg/m^3 6 M

b) Explain about Inverted Differential Manometer with neat sketch. 6 M

OR

3. a) Explain any three physical properties of Fluids with units of measurement. 6 M

b) Explain 6 M

i) Gauge Pressure.

ii) Vacuum Pressure.

iii) Absolute Pressure and relate all these pressures with neat sketch.

UNIT – II

4. a) A triangular gate with a base width of 2 m and a height of 1.5 m lies in a vertical plane. The top vertex of the gate is 1.5 m below the surface of a tank which contains oil of specific gravity 0.8. Considering the density of water and acceleration due to gravity to be 1000 kg/m^3 and 9.81 m/s^2, respectively, Find the hydrostatic force (in kN) exerted by the oil on the gate? 6 M

b) Explain stream and velocity potential functions along with expressions. 6 M

OR

5. a) Derive an expression for the depth of centre of pressure from free surface of liquid of a vertical plane surface submerged in the liquid. 6 M

b) Differentiate between 6 M

i) Rotational and Irrotational Flow.

ii) Steady and Unsteady Flow.

iii) Uniform and Non-Uniform Flow.

UNIT-III

6. a) Derive the Bernoulli's equation of motion for 3D flow. 6 M

   b) Explain the boundary layer phenomenon along a long thin flat plate and its characteristics with neat sketch. 6 M

OR

7. a) State the Momentum equation and explain the force exerted by flowing fluid on a pipe bend. 6 M

   b) For the velocity profile given below, state whether the boundary layer has separated or on the verge of separation or will remain attached with the surface: 6 M

   i) $\frac{u}{U} = 2(\frac{y}{\delta}) - (\frac{y}{\delta})^2$ ii) $\frac{u}{U} = -2\,(\frac{y}{\delta}) + \frac{1}{2}(\frac{y}{\delta})^3$ and

   iii) $\frac{u}{U} = \frac{3}{2}(\frac{y}{\delta})^2 + \frac{1}{2}(\frac{y}{\delta})^3$

UNIT – IV

8. a) Explain Reynold's experiment with the help of neat sketch. 6 M

   b) Derive the Darcy-Weisbach equation for frictional head loss in a pipe. 6 M

OR

9. a) Explain characteristics of laminar and turbulent flows. 6 M

   b) Explain the laminar flow behavior when one plate is at rest and the other plate is moving. 6 M

UNIT – V

10.	a)	An oil of specific gravity 0.85 is flowing through a venturi meter having inlet diameter 20cm and throat diameter 10cm. The oil mercury differential manometer shows a reading of 30cm. Calculate the discharge of oil through the horizontal venturi meter. Take Cd as 0.98.	6 M
	b)	Derive the expression for discharge over a rectangular notch.	6 M

OR

11.	a)	Explain Stepped Notches with neat sketch.	6 M
	b)	Derive the expression for discharge over a triangular notch.	6 M