BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - III CIVIL : WINTER- 2022
SUBJECT : FLUID MECHANICS

Day : Tuesday
Date : 13-12-2022

W-25298-2022

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labelled diagram **WHEREVER** necessary.
4) Use of non – programmable **CALCULATOR** is allowed.
5) Assume suitable data if necessary,

Q.1 a) Enlist physical properties of fluids and define Mass density and Specific weight with units. **(05)**

b) A circular plate of 1m diameter is submerged vertically in water in such a way that its greatest depth is at 2 m depth below free water surface. Determine **(05)**
   i) The total pressure on one face of the plate and
   ii) The position of center of pressure

OR

Q.1 a) Prove that BM = I/V **(05)**

b) If 5 m^3 volume of certain fluids weights 5000 N Find **(05)**
   i) Specific weight
   ii) Mass Density and
   iii) Specific gravity of the fluid

Q.2 a) Define : **(05)**
   i) Velocity Potential and
   ii) Stream Function

b) A pipe of 450 mm diameter branches in to two pipes of 200 mm and 250 mm diameter pipes respectively. If average velocity of flow in 450 mm diameter pipe is 2.5 m/s **(05)**
Find:
   i) Discharge through 450 mm diameter pipe
   ii) Velocity in 250 mm diameter pipe if average velocity in 200 mm diameter pipe is 1.5 m/s

OR

Q.2 a) Enlist Different types of flow and define : **(05)**
Steady flow
Uniform flow

b) For two dimensional flow velocity function is given by $\phi = x^2 - y^2$. **(05)**
Determine velocity components in X and Y directions.

Q.3 a) What is total energy line and hydraulic gradient line? **(05)**

b) A smooth inclined pipe is having 200 mm diameter and pressure of 45 kPa at end A. At other end B, the elevation is 2.5 m and pressure is 50 kPa and velocity is 2 m/s Determine the direction of flow and head loss. Density of water = 1000 kg / m^3. **(05)**

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OR

Q.3 a) Explain Bernoulli's theorem with significance of each term in it. (05)

b) Water is flowing through a tapering pipe of 200 mm diameter at section 1 and 150 mm diameter at section 2. The discharge through the pipe is 0.01 m^3/s. The section 1 is 2 m above the datum line and section 2 is 5 m above the datum line. Find the intensity of pressure at section 2 if the intensity at section 1 is 150 kN /m^2. (05)

Q.4 a) What are distorted and undistorted models? (05)

b) The resisting force F on the aero plane depends upon length of aircraft l, velocity V, air density p, air viscosity μ, and bulk modulus of air K. Express functional relationship between dependent and independent variables. (05)

OR

Q.4 a) What is Geometric and kinematic similarity? (05)

b) The efficiency of a fan depends upon air density p, dynamic viscosity of air μ the angular velocity ω and the diameter D of the rotor, the discharge Q Express η in terms of dimensionless parameters. (05)

Q.5 a) Explain development of Boundary Layer over a flat plate. (05)

b) Derive Hagen Poisullies equation? (05)

OR

Q.5 a) Define: (05)
i) Displacement Thickness
ii) Momentum Thickness

b) Derive equation for shear stress in case of viscous flow through circular pipe. (05)

Q.6 a) What is (05)
i) Instantaneous velocity
ii) Temporal Mean velocity

b) Explain with diagram (05)
i) Pipes in series
ii) Pipes in Parallel

OR

Q.6 a) What is (05)
i) Scale of turbulence
ii) Intensity of Turbulence

b) What are Major and minor losses in a pipe flow? (05)

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