B.Tech. || CE || 3rdSem.
Fluid Mechanics
Subject Code:BTCE-302A
Paper ID:

Time allowed: 3 Hrs

Important Instructions:

Max Marks: 60

- All questions are compulsory
- Assume any missing data
- Additional instructions, if any

PART A (2×10)

Q. 1. Short-Answer Questions: All COs
    (a) What is Pascal's law and its applications?
    (b) Describe Newton's law of viscosity and its significance.
    (c) What is relation between stream function and velocity potential?
    (d) What is Meta centre.
    (e) Write Euler's equation.
    (f) Write expressions for continuity equation in Cartesian coordinates.
    (g) What is dimensional homogeneity give to non-dimensional equations.
    (h) Draw Moody's diagram..
    (i) Which is most efficient flow section for open channels and why?
    (j) What is critical depth for trapezoidal channel?

PART B (8×5)

Q. 2. A plate (2m x 2m), 0.25 mm distant apart from a fixed plate, moves at 40   CO1
cm/s and requires a force of 3 N. Determine the dynamic viscosity of the fluid
in between the plates.

OR

Derive expression for centre of pressure for inclined plane surface at 30^{0} angle   CO1
with horizontal.

Q. 3. Derive Bernoulli's equation adding total losses.

CO2

OR

A stream function in a two-dimensional flow is ψ = 2xy in which ψ is in cm^2 CO2
per second and x and y are in meters. Calculate convective acceleration and
flow rate at point (3,1).

Q. 4. Find the form of equation for torque T on a shaft of diameter D revolving at   CO3
speed N in a fluid of density ρ and viscosity μ.

OR

In an experiment on 90^0 V-notch the flow is collected in a vertical cylindrical CO3
tank of 0.9 m diameter. It was found that depth of water increase by 0.65 m in
16.8 s when head over the notch is 0.2 m. Determine the coefficient of
discharge of notch.

Q. 5.   A pipe 40 mm diameter is 8 m long and the velocity of flow of water is 2 m/s. CO4
what loss of head be saved if central 3 m of length is replaced with 75 mm
diameter pipe, the change of section being sudden. Take f=0.04 for both
pipes.

OR

Assuming the velocity distribution in a circular pipe.   CO4

$$V=V_{max.}\{1-(r/R)\}^{1/7}$$

Calculate (i) The ratio of mean and average velocity
            (ii) The radius at which average velocity occurs.

Q. 6.   a) Write Ganguillet-Kutter formula its applications.   CO5&6
        b) Discuss specific energy curves.

OR

a) Show that for most economical triangular section the angle of sloping sides CO5&6
which they make with vertical must be 45^0.
b) Discuss sequent depths.