Registration No.: | | | | | | | | | | |

Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code CIPC2003

3rd Semester Regular/Back Examination: 2025-26
SUBJECT: Fluid Mechanics
BRANCH(S): C&EE, CIVIL, ENV, CE
Time: 3 Hours
Max Marks: 100
Q.Code: U677

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define specific volume and specific gravity of a fluid.
b) Define pascal's law.
c) What do you understand by total pressure and center of pressure?
d) Differentiate between Stream line, path line, and streak line.
e) What are the different types of forces involved in Euler's equation?
f) Differentiate between rotational and irrotational motion.
g) Give a brief note on application of Pitot tube.
h) Enlist the types of hydraulic coefficients.
i) List out the characteristics of laminar flow.
j) List out the minor losses those happen in pipe.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Find out the minimum size of glass tube that can be used to measure water level if the capillary rise in the tube is to be restricted to 2 mm. Consider surface tension of water in contact with air as 0.073575 N/m.
b) An oil of viscosity of 0.50 N-S/m^2 is used for lubrication between a shaft and a sleeve. The diameter of shaft is 0.50 m and it rotates at 200 rpm. Find the power lost in oil for a sleeve length of 100 mm. The thickness of the oil film is 1 mm.
c) Derive an Expression for total pressure force and depth of pressure for a vertical surface submerged in water.
d) A block of wood of specific gravity 0.7 floats in water. Determine the metacentric height of the block if its size is 2 m × 1 m × 0.8 m.
e) If for a two- dimensional potential flow, the velocity potential is given by $\Phi = x\,(2y - 1)$ Determine the velocity at the point p (4, 5). Also determine the value of stream function Ψ at the point P.
f) Write in detail about the classification of orifices.

g) State Bernoulli's equation? Write the assumptions for such a derivation?

h) Briefly explain about the Viscometer.

i) Write Short note on water hammer in pipe.

j) Explain the concept of equivalent pipe when many pipes are connected in series.

k) Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using (i) Darcy formula, (ii) Chezy's formula for which C = 60.

l) Obtain an expression for Velocity distribution in turbulent flow for smooth pipe.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Determine the total pressure and Centre of pressure on an isosceles triangular plate of base 5 m and altitude 5 m when the plate is immersed vertically in an oil of specific gravity 0.8. The base of the plate is 1 m below the free surface of oil. **(16)**

Q4 **a)** Derive the expression for rate of flow through the venturimeter? **(8 + 8)**

b) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 60 lit/s. Find the reading of oil-mercury differential manometer. (Take Cd = 0.9).

Q5 **a)** Define hydraulic gradient line and energy gradient line in a pipe with sketch. **(4 + 12)**

b) Two tanks containing water are connected by a horizontal pipe of length 25 m and diameter 20 cm. If the difference of water surface in the reservoir is 4 m, find the rate of flow. Also draw the energy gradient line and hydraulic gradient line.
(Take Darcy's friction factor f = 0.01).

Q6 Briefly explain the laminar fluid flow in parallel plates when both plates at rest and one plate at rest and other moving. **(16)**