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Total No. of Questions : 09] [Total No. of Pages : 03

Paper ID [A0810]

(Please fill this Paper ID in OMR Sheet)

B.Tech. (Sem 4th)

FLUID MECHANIC)

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 × 2 = 20)*

a) Distinguish between Newtonian and non-Newtonian fluids.

b) Discuss Archimede's Principle.

c) What is the type of flow for Mach number = 1 and for Mach number>1.

d) What do flow net mean?

e) How do you account for friction loss when applying Bernoulli's equation to real fluid flows?

f) State Buckingham's Pi theorem.

g) What is Weber number? State its significance.

h) Write any one equation which can be used for measuring of head loss due to friction in turbulent flow.

i) Write the value of Reynolds number for turbulent and laminar flow.

j) Define a weir. State the difference between a notch and weir.

Section - B

(4 × 5 = 20)

Q2) (a) State Pascal's law.

(b) A square plate 1.5 x 1.5 is submerged in a liquid bath of specific gravity 0.9. The maxir·um and minimum depth of the plate are 2m and 1.5m from the su he hydrostatic force on one face of the plate and the dept essure.

Q3) The velocity potential for a 2-D flow is given by $\phi = x^2 + y^2(y-1)$. Determine the velocity at the point B (8,10). Also determine the value of stream function at the given point.

Q4) The efficiency of a equipment depends on the density, ρ, the dynamic viscosity, μ of the fluid, the angular velocity, ω, the diameter, D of the rotor and the discharge Q. Express efficiency in terms of dimensionless parameters.

Q5) Explain how vena contracta is develop in a fluid flowing through an orifice. A tank made on the ground is 3 m high. It is kept full of water. There is small orifice in its vertical side with its centre at depth h meters below the free surface of liquid in the tank. Find the value of h so that the liquid jet strikes the ground at the maximum distance from the tank.

Q6) Find the expression for discharge per unit width between two parallel plates distance b apart, when one plate is moving at velocity V while the other one is held stationary, for the condition of zero shear stress at the fixed plate.

Section - C

(2 × 10 = 20)

Q7) Derive the continuity equation for incompressible flow in polar coordinates.

Q8) (a) Derive the Bernoulli's theorem, stating all the assumptions used for its derivation.

(b) Water flows with a velocity of 15m/s along a 8 cm diameter pipe to a nozzle 40 cm long and which is so profiled that the pressure drops uniformly along its axis. Measurements indicate that there is a steady pressure of 200000 N/m^2 at entrance to the nozzle. Estimate the acceleration of the water in passing through the nozzle, the velocity and the diameter of the jet and the vertical height to which the jet would rise. Neglect friction.

Q9) (a) Explain the major and minor losses in detail. Under what conditions the minor losses are negligible.

(b) For the sudden expansions in pipe flow, find the optimum ratio between the diameter of the pipe before expansion and the diameter of pipe after expansion so that the pressure rise is maximum.