Roll No. Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(CE) (2012 to 2017) (Sem.–3)

FLUID MECHANICS-I

Subject Code : BTCE-301

M.Code : 56072

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

Q1. Answer briefly :

a) If the specific gravity of a liquid is 3.0, calculate its specific weight.

b) What is the function of the U tube simple manometer?

c) Define Pathline of a fluid particle.

d) "*A free vortex flow has the velocity decreasing with radius*". Justify the statement with reasons.

e) What will be the position of centre of gravity and metacentre for a body floats in stable equilibrium?

f) What is the scale ratio for time in model analysis according to Froude's number?

g) Write the expression for the determination of drag force for a body moving through a fluid of mass density ρ at a uniform velocity V.

h) Define velocity of approach in the expression of discharge over a weir.

i) Write the various components of a venturimeter.

j) Write the dimension of dynamic viscosity.

SECTION-B

2. A rectangular plate of size 25 cm × 50 cm and weighing 250 N slides down a 25° inclined surface at a uniform velocity of 1.5 m/s. If the uniform gap of 2 mm between the plate and the inclined surface is filled with oil, determine the viscosity of oil.

3. A trapezoidal plate of 6 m wide at top, 3 m wide at bottom and 1.5 m deep is used to close an opening of the same size. The water on one side of trapezoidal plate is just level at the top of the plate and the other side of plate is empty. Calculate the total pressure and centre of pressure on the plate.

4. The velocity field in a flow is given by $u = x^2 + 2xy$; $v = y^2 + 2xy$. Determine the circulation around a closed curve defined by (1,1), (3,1), (3,4) and (1,4).

5. Define velocity of approach. How can you account for it while computing discharge over weirs?

6. Derive the expression for kinetic energy correction factor.

SECTION-C

7. Determine the form of the equation for discharge Q through a sharp-edged triangular notch using Buckingham π theorem assuming Q depends on the central angle α of the notch, head H, acceleration due to gravity g, density of fluid ρ, viscosity of fluid μ and surface tension σ of the fluid.

8. A cylinder 1.2 m in diameter is rotated about its axis in air having a velocity of 128 km/hour. A lift of 5886 N/m length of the cylinder is developed on the body. Assuming ideal fluid theory, find the rotational speed and the location of stagnation points. Density of air is 1.236 kg/m^3.

9. Derive the Bernoulli's equation mentioning the assumptions used for the derivations.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.