Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) (Sem.–3)

FLUID MECHANICS

Subject Code : BTME/301/18

M.Code : 76417

Date of Examination : 11-06-2024

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS 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

1. Write briefly :

a) Explain how certain insects are able to walk on the surface of water?

b) An oil of specific weight 0.7 is under a pressure of 150 kN/m^2, express pressure head in meters of water.

c) How the rolling period of a ship affect its stability?

d) List the properties of stream function.

e) What are the assumptions made while deriving Bernoulli's equation?

f) Define Vena-contracta.

g) Give few examples of laminar flow.

h) What are conditions for pipes in series?

i) Define turbulence and turbulent flow.

j) What is the difference between a model and a prototype?

SECTION-B

2. The velocity components in a three-dimensional flow are $u = xy^3z, v = -y^2z^2$ and $w = yz^2 - \frac{y^3z^2}{2}$. Determine the rotation at (1, 1, 2).

3. Explain how metacentric height can be calculated experimentally?

4. Find an expression for the drag force on a smooth sphere of diameter *D*, moving with a uniform velocity *v* in a fluid of density ρ and dynamic viscosity μ.

5. Explain with a neat sketch the working of a single column manometer

6. The velocity distribution in a pipe is given by :

$$\frac{u}{u_{\max}} = 1 - \left(\frac{r}{R}\right)^n$$

Obtain an expression for mean velocity in terms of n and u_{max}.

SECTION-C

7. Derive mass conservation equation for an unsteady compressible flow in cylindrical coordinates (r, θ, z). Simplify it for an incompressible flow.

8. A venturimeter has its axis vertical, the inlet and throat diameters being 150 *mm* and 75 *mm* respectively. The throat is 0.225 *m* above inlet and venturimeter constant is 0.96. A liquid of specific gravity 0.78 flows up through the meter at a rate of 0.029 m^3/s. Calculate the pressure difference between inlet and outlet.

9. Explain what is meant by forced vortex? Derive an expression for the radial pressure distribution in forced vortex.

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.