

Reg. No. :

--	--	--	--	--	--	--	--	--	--

**Question Paper Code: 43105**

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

Third Semester

Civil Engineering

14UCE305-FLUID MECHANICS

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 1 = 10 Marks)

1. A fluid, which is incompressible and is having no viscosity is known as
  - (a) Real fluid
  - (b) Ideal Fluid
  - (c) Newtonian Fluid
  - (d) Non Newtonian Fluid
2. The ratio of Compressive Stress to volumetric Strain is
  - (a) Compressibility
  - (b) Bulk Modulus
  - (c) Pressure
  - (d) Capillarity
3. The point through which force of buoyancy is supposed to act is known as
  - (a) Force of Buoyancy
  - (b) Centre of Buoyancy
  - (c) Floating point
  - (d) metacenter
4. Bernoulli's theorem deals with the law of conservation of
  - (a) Mass
  - (b) Momentum
  - (c) Energy
  - (d) None of these
5. A flow is said to be steady when
  - (a) conditions change steadily with time
  - (b) conditions do not change with time at any point
  - (c) conditions do not change steadily with time at any point
  - (d) the velocity does not change at all with time at any point

6. The continuity equation is the result of application of the following law to the flow field
  - (a) First law of thermodynamics
  - (b) Conservation of energy
  - (c) Newton's second law of motion
  - (d) Conservation of mass
7. Bernoulli's equation cannot be applied when the flow is
  - (a) rotational
  - (b) turbulent
  - (c) unsteady
  - (d) all the above
8. In pipe flow the critical Reynolds number is about
  - (a) 640
  - (b)  $5 \times 10^5$
  - (c) 2000
  - (d) 64000
9. Model analysis of free surface flows are based on
  - (a) Reynolds number
  - (b) Froude number
  - (c) Mach number
  - (d) Euler number
10. Geometric similarity between model and prototype means
  - (a) Similarity of discharge
  - (b) Similarity of linear dimensions
  - (c) Similarity of motion
  - (d) Similarity of forces

PART - B (5 x 2 = 10 Marks)

11. Estimate the pressure inside a water droplet of 0.5mm diameter. Assume  $\sigma = 0.073 \text{ N/m}$ .
12. Define centre of buoyancy and metacenter.
13. Define stream function.
14. State momentum principle.
15. What are the similarities between model and prototype?

PART - C (5 x 16 = 80 Marks)

16. (a) The velocity distribution of flow over a plate is parabolic with vertex 30 cm from the plate, where the velocity is 180 cm/s. If the viscosity of the fluid is  $0.9 \text{ Ns/m}^2$  find the Properties of fluids velocity gradients and shear stresses at distance of 0.15 cm and 30 cm from the plate. (16)

Or

- (b) Explain in detail about Types of Fluid & discuss about Surface tension. (16)
17. (a) An open tank contains water up to a depth of 2 m and above it an oil of sp. gr. 0.9 for a depth of 1 m. Find the pressure intensity (i) at the interface of the two liquids, and (ii) at the bottom of the tank. (16)

Or

(b) Prove that the pressure at a point in a static fluid is equal in all direction. (16)

18. (a) Describe in detail about Types of Fluid Flow. (16)

Or

(b) If for a two-dimensional potential flow, the velocity potential function is given by  $\phi = x(2y-1)$ , determine the velocity at the point  $P(2, 3)$ . Also determine also the value of stream function at the point  $P$ . (16)

19. (a) The water is flowing through a taper pipe of length  $100\text{ m}$  having diameter  $600\text{ mm}$  at upper end and  $300\text{ mm}$  at lower end at the rate of  $50\text{ lit/s}$ . The pipe have a slope of  $1$  in  $30$ . Find the pressure at the lower end if the pressure at the higher level is  $19.62\text{ N/cm}^2$ . (16)

Or

(b) The inlet and throat diameters of a horizontal venturimeter are  $30\text{ cm}$  and  $10\text{ cm}$  respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is  $13.734\text{ N/cm}^2$  while the vacuum pressure head at the throat is  $37\text{ cm}$  of mercury. Find the rate of flow. Assume that  $4\%$  of the differential head is lost between the inlet and throat. Find also the value of  $C_d$  for the venturimeter. (16)

20. (a) The resistance  $R$  experienced by a partially submerged body depends upon the velocity  $V$ , length of the body  $L$ , viscosity of the fluid  $\mu$ , density of the fluid  $\rho$  and gravitational acceleration  $g$ . Obtain a dimensionless expression for  $R$ . (16)

Or

(b) The pressure difference  $\Delta p$  in a pipe of diameter  $D$  and length  $L$  due to viscous flow depends on the velocity  $V$ , Viscosity  $\mu$  and density  $\rho$ . Using Buckingham's theorem, obtain an expression for  $\Delta p$ . (16)

