Reg. No. : | | | | | | | | | | |

Question Paper Code: 43105

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

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) 5×10^5 (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 0.5*mm* diameter. Assume σ =0.073*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 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 $\varphi = x$ (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 *m* having diameter 600 *mm* at upper end and 300 *mm* at lower end at the rate of 50 *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 19.62N/cm^2. (16)

Or

(b) The inlet and throat diameters of a horizontal venturimeter are 30 *cm* and 10 *cm* respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is 13.734 N/cm^2 while the vacuum pressure head at the throat is 37 *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 *Cd* 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 μ, density of the fluid ρ and gravitational acceleration g. Obtain a dimensionless expression for R. (16)

Or

(b) The pressure difference Δp in a pipe of diameter *D* and length *L* due to viscous flow depends on the velocity *V*, Viscosity μ and density ρ. Using Buckingham's theorem, obtain an expression for Δp. (16)

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