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**Question Paper Code: 43105**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Third Semester

Civil Engineering

14UCE305-FLUID MECHANICS

(Regulation 2014)

Duration: Threehours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 1 = 10 Marks)

- The increase of temperature
  - increase the viscosity of a liquid
  - decrease the viscosity of a liquid
  - increase the viscosity of a gas
  - both (b) & (c).
- Surface tension has the units of
  - force per unit area
  - force per unit length
  - force per unit volume
  - none of the above
- The centre of gravity of the volume of the liquid displaced is called
  - Centre of pressure
  - Centre of buoyancy
  - Metacentre
  - None of these
- Bernoulli's theorem deals with the law of conservation of
  - Mass
  - Momentum
  - Energy
  - None of these
- The equation of continuity in fluid mechanics
  - is a condition of equilibrium in the flow pattern
  - is an embodiment of the law of thermodynamics
  - express the relation between work and energy
  - is an embodiment of laws of conservation of mass

6. If the velocity, pressure, density etc., do not change at a point with respect to a time, flow is called
- (a) uniform                      (b) incompressible    (c) non-uniform                      (d) steady
7. Bernoulli's theorem deals with law of conservation of
- (a) mass                      (b) momentum                      (c) energy                      (d) none of these
8. A  $U$  tube manometer reading for the horizontal and inclined pipe for the constant rate of flow
- (a) will remain the same                      (b) will increase  
(c) will decrease                      (d) may fluctuate with the time
9. The repeating variables in a dimensional analysis should be such as to
- (a) excluded the dependent variables  
(b) include the unimportant factors  
(c) include the important set of factors  
(d) have two variables with same dimensions
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. What is meant by surface tension?
12. When will you use inverted  $U$  tube manometer?
13. Define velocity.
14. Define the term "Momentum thickness".
15. What is similitude?

PART - C (5 x 16 = 80 Marks)

16. (a) The space between two square flat parallel plate is filled with oil. Each side of the plate is 60  $cm$ . The thickness of the oil film is 12.5  $mm$ . The upper plate which moves at 2.5  $m/s$  requires a force of 98.1  $N$  to maintain the speed. Determine the (i) Dynamic viscosity of the oil in poise (ii) Kinematic viscosity of the oil in stokes of the specific gravity of the oil is 0.95. (16)

Or

(b) Explain in detail about Types of Fluid & discuss about Surface tension. (16)

17. (a) The right limb of a simple U-tube manometer containing mercury is open to the atmosphere where the left limb is connected to a pipe in which a fluid of specific gravity of 0.9 is flowing; the centre of pipe is 12cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limb is 20cm. (16)

Or

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

18. (a) Derive an expression for a three dimensional continuity equation for Cartesian co- ordinate and reduces to two and one dimensional 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 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) Explain the methods of Dimensional Analysis. (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)

