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Question Paper Code : 52241

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Third Semester

Civil Engineering

CE 2202 – MECHANICS OF FLUIDS

(Regulations 2008)

(Common to (PTCE 2202) – Mechanics of Fluids for B.E. (Part-Time)

Third Semester – Civil Engineering – Regulations 2009)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. Calculate the specific weight, specific mass, specific volume and specific gravity of a liquid having a volume of 7 m^3 and weight of 50 kN.
2. What is meant by control volume ?
3. State hydrostatic law.
4. Differentiate stream line and streak line.
5. Draw the shear stress and velocity distribution diagram for the viscous flow between parallel plates.
6. State momentum principle.
7. List any five minor losses in a pipe flow.
8. What is meant by equivalent pipe ?
9. State Buckingham's Pi theorem.
10. What is meant by dynamic similarity ?



11. a) The velocity distribution of flow over a plate is parabolic with vertex 25 cm from the plate, where the velocity is 160 cm/s. If the viscosity of the fluid is 0.9 N.s/m^2 find the velocity gradients and shear stresses at a distances of 0, 20 cm and 30 cm from the plate.
- (OR)
- b) If the equation of a velocity profile over a plate is $v = (2y^2)/3$; in which v is the velocity in m/s at a distance of y metres above the plate, determine the shear stress in SI system and Metric gravitational system of units at $y = 0$ and $y = 0.075$ m. Given $\mu = 0.835 \text{ N.s/m}^2$ (or 8.35 poise).
12. a) Derive an expression for force exerted on a submerged vertical plane surface by the static liquid and locate the position of centre of pressure.
- (OR)
- b) Derive the continuity equation in Cartesian coordinates.
13. a) Derive Hagen Poiseuille equation.
- (OR)
- b) State and derive Bernoulli's theorem, mentioning clearly the assumptions underlying it.
14. a) The difference in water surface levels in the two tanks, which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and of diameters 300 mm, 200 mm and 400 mm respectively, is 12 m. Determine the rate of flow of water if coefficient of friction is 0.005, 0.0052 and 0.0048 respectively, considering (i) minor losses also (ii) Neglecting minor losses.
- (OR)
- b) Discuss the concept of boundary layer formation, derive the expression for displacement thickness and list the methods of boundary layer separation.
15. a) Discuss the types of non-dimensional numbers and derive any two of them. Also explain the significances of these dimensionless numbers for fluid flow problem.
- (OR)
- b) The pressure drop Δp in a pipe of diameter D and length l depends on mass density ρ and viscosity μ of the flowing fluid, mean velocity of flow V , and average height k of roughness projections on the pipe surface. Obtain a dimensionless expression for Δp . Hence show that $hf = \frac{f l V^2}{2gD}$ where hf head loss due to friction ($\Delta p/w$), w is specific weight of fluid and f is coefficient of friction.