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B. E / B. Tech. (Part Time) DEGREE END SEMESTER EXAMINATIONS NOV/DEC 2013
CIVIL ENGINEERING BRANCH
SECOND SEMESTER
PTCE 233/ PTCE 272/ PTCE 9202 FLUID MECHANICS
(REGULATION 2002 /2005/ 2009)

TIME: 3 hr Max Mark: 100

Answer ALL questions

PART – A (10 x 2 = 20 MARKS)

1. If $6m^3$ of a certain oil weighs 5000 kg (f). Calculate the specific weight, mass density and specific gravity of the oil.
2. What is the limitation of peizometers?
3. Define stream line and streak line
4. What is meant by vena contracta?
5. How Rayleigh's method is different from Buckingham's Pi theorem method?
6. Derive an expression for Froude dimensionless number
7. Write the equation for velocity distribution at any value of 'r' of viscous flow through circular pipes.
8. What are compound pipes?
9. Define momentum thickness
10. How boundary layers are prevented?

PART – B (5 x 16 = 80 Marks)

11. a. i Derive an expression for total pressure and centre of pressure of a horizontal plane surface (8)

a. ii The vertical side of a reservoir has a rectangular opening 3 m long and 1.2 m high. It is closed by a plate using bolts placed at the corners of the opening. What would be the tension in the bolts if water stands to a height of 1.8m above the top edge of the opening which is horizontal? (8)

12. a. i A 45 degree reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 600 mm and 300 mm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet to bend is 9 N/cm^2 and rate of flow of water is 700 lps. (16)

OR

12. b.i If for a two dimensional potential flow, the velocity potential is given by $\Phi = x(2y-1)$. Determine the velocity at the point P (5, 5). Determine also the value of stream function Ψ at the point P. (10)

b.ii Explain the various types of flows in pipes. (6)

13. a.i Explain the different types of hydraulic similarities that must exist between a prototype and its model. (6)

a.ii The efficiency η of a fan depends on the density ρ, the dynamic viscosity μ of the fluid, the angular velocity ω, diameter D of the rotor and the discharge Q. Using Rayleigh's method express η in terms of dimensionless parameters. (10)

OR

13. b.i A small sphere of density ρ_s and diameter D settles at a terminal velocity V in a liquid of density ρ_f and dynamic viscosity μ. Gravity g is known to be a parameter. Express the functional relationships between these variables in a dimensionless form. (10)

b.ii Derive the scale ratios of Froude number (6)

14. a. i Show that the difference of pressure head for a given length of two parallel plates which are fixed and through which viscous fluid is flowing is given by $h_f = 12\mu uL/\rho gt^2$ (16)

OR

14. b. i Draw the HGL and TEL lines if the difference in water surface levels in the two tanks, which are connected by three pipes in series of lengths 300m, 170m and 210m and of diameters 300mm, 100mm and 200mm respectively, is 10m. Determine the rate of flow of water if co-efficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering (i) minor losses also (ii) Neglecting minor losses (16)

15. a.i Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $u/U = 4(y/\delta) - 2(y/\delta)^2$ (16)

OR

15. b.i Derive the Von Karman momentum integral equation for boundary layer flows (16)