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Question Paper Code : 21197

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Third Semester

Civil Engineering

CE 2202/CE 35/CE 1203/10111 CE 305/080100015 — MECHANICS OF FLUIDS

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List out the phenomena responsible for capillary rise or fall.

2. Define viscosity.

3. Enlist different types of differential manometers.

4. State Pascal's law.

5. Define meta centre.

6. List out the assumptions made in deriving Bernoulli's theorem.

7. Differentiate between pipes in parallel and pipes in series.

8. Define boundary layer.

9. Write a note on distorted models.

10. List the similitude involved in the model analysis.

PART B — (5 × 16 = 80 marks)

11. (a) At a depth of 3 km in the ocean the pressure is 80000 kN/m^2. The specific weight at the surface is 10.055 kN / m^3. The bulk modulus of elasticity is 2.35×10^9 N/m^2. Find the change in the specific volume, specific volume at that depth and the specific weight at that depth. (16)

Or

(b) Explain the following with neat sketches :

(i) Surface tension. (4)

(ii) Continuum concept of system. (4)

(iii) Newtonian fluid and non Newtonian fluid. (4)

(iv) Convective acceleration. (4)

12. (a) The velocity components in a two dimensional incompressible flow are $u = y^3 + 6x - 3x^2y$; and $v = 3xy^2 - 6y - x^3$. Check the flow is continuous and irrotational. If the flow is irrotational find the potential function and stream function at the point (1, 2). (16)

Or

(b) Derive an expression to find the distance of centre of pressure from free surface of liquid of an inclined plane surface submerged in the liquid. (16)

13. (a) Derive an expression for the velocity distribution for the viscous flow through a circular pipe and sketch the shear stress distribution and velocity distribution across the section of the pipe. (16)

Or

(b) Derive the Euler's equation of motion for steady flow of an ideal fluid. Using Euler's equation, derive the Bernoulli's equation and also write down the assumption made in the derivation of the above equation. (16)

14. (a) (i) What are different major and minor losses when there is a flow through pipes? (8)

(ii) Derive the expression for displacement thickness. (8)

Or

(b) Derive the equation for the friction loss in a pipe line also determine the friction in a pipe of 400 m long and 200 mm diameter when the discharge is 3 m^3/min and the resistance coefficient $f = 0.01$. (16)

15. (a) Write short notes on :

(i) Raleigh's method. (6)

(ii) Scale effect in model study. (5)

(iii) Buckingham's Pi-theorem. (5)

Or

(b) An oil of specific gravity 0.91 and viscosity of 0.03 poise is to be transported at the rate of 3 m^3/s through a 1.3 m diameter pipe. Model tests were conducted on a 130 mm diameter pipe using water having viscosity of 0.01 poise. Find the velocity of flow and discharge in the model. (16)