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**Question Paper Code : P 1137**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Third Semester

Civil Engineering

CE 1202 — MECHANICS OF FLUIDS

(Common to B.E. (Part-Time) Second Semester - Regulation 2005)

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between perfect gas and ideal fluid.
2. Give the dimensions of surface tension, kinematic viscosity.
3. Write the hydrostatic equation.
4. Define streamline, streakline and pathlines.
5. Define coefficient of discharge.
6. How do you classify the flow as either laminar or turbulent in a pipe?
7. List the minor losses in a pipe system.
8. What is an equivalent pipe for pipes in series?
9. What is meant by Dimensional Homogeneity?
10. What do you understand by scale effect?

PART B --- (5 × 16 = 80 marks)

11. (a) A tube of 2 mm bore is immersed in an oil of specific gravity 0.8 upto 2 cm below the free surface. If the pressure required to blow a bubble is 188 N/m<sup>2</sup>, find the surface tension of the oil.

Or

- (b) An automobile tyre has a capacity of 0.3 m<sup>3</sup>. The tyre is filled at pressure of 2600 kN/m<sup>2</sup> at 25°C. What will be the pressure if the tyre is heated to a temperature of 60°C?
12. (a) A circular gate 1 m in diameter is located in a tank wall inclined at 60° to the horizontal. The centre of the gate is at a vertical depth of 1.5 m below the water surface. Find the resultant force and centre of pressure.

Or

- (b) A conical nozzle of 20 cm inlet diameter and 10 cm outlet diameter is 30 cm long. The nozzle discharges water at 30 litres per second. Find the velocity and acceleration of water at the centre of the nozzle.
13. (a) Derive the Euler's equation for flow along a streamline. Stating assumptions deduce the Bernoulli's equation.

Or

- (b) A reducer bend has an inlet of 30 cm and an outlet of 15 cm diameter. The outlet is turned at a deflection angle of 45° and the bend lies in the horizontal plane. Water is discharged at the rate of 90 litres per second through the bend. The pressure at the outlet end is 20 kPa, determine the magnitude and direction of the force required to keep the bend in position.
14. (a) The boundary layer profile is given by  $\frac{u}{U_0} = \sin\left(\frac{\pi y}{2\delta}\right)$ . Find the displacement thickness, momentum thickness and energy thickness of the boundary layer.

Or

- (b) Two pipes, each of 10cm in diameter and length 100 m, are connected in parallel between two points. Calculate the
- (i) Equivalent length of a single pipe of 10 cm diameter
- (ii) Equivalent diameter of a single pipe of length 100 m.

15. (a) A thin film of viscous liquid of density  $\rho$  and viscosity  $\mu$ , occupies the space  $b$  between a flat stationary plate and a rotating circular plate above. Find the expression for torque  $T$  exerted on the circular plate of radius  $a$  rotating at speed  $N$ .

Or

- (b) The discharge over a weir 150 m long and 15 m in height is to be estimated by means of a model built to a scale 1 : 25. What are the scales for velocity and discharge? If the pressure measured at a given point in the model on the face of the spillway is 0.01 m, to what pressure does this correspond on the prototype?