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No. of Printed Pages—3

CE—301

B. TECH

THIRD SEMESTER EXAMINATION, 2002-2003

FLUID MECHANICS

Time : 3 Hours

Total Marks : 100

Note : (1) Attempt **ALL** the questions.

(2) Use Illustrations wherever required.

(3) Assume missing data suitably, if any, and state the assumptions made.

1. Answer any FOUR of the following :— (5×4=20)

(a) Explain the phenomenon of Capillarity. Obtain an expression for capillary rise or fall of a liquid in very small diameter tube.

(b) What is Continuum ? Is air a continuum ? Does it always remain so ?

(c) Define the following and give one practical example for each :—

Laminar flow, Turbulent flow, Unsteady flow and Uniform flow.

(d) Describe the use and limitations of the flow nets.

(e) Check whether the function $\Psi = A(x^2 - y^2)$ represent the possible irrotational flow phenomenon.

(f) Prove that a stream function Ψ represents the equation for a stream line.

2. Answer any FOUR of the following :— (5×4=20)

- (a) What are the conditions of equilibrium of a floating body ? Discuss with neat sketches.
- (b) A circular plate 4m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4m and 2m respectively. Determine the total pressure on one face of the plate and position of the centre of pressure.
- (c) Derive Bernoulli's equation from Euler equation of motion. State the assumption also.
- (d) Discuss the relative merits and demerits of Venturimeter with respect to Orifice meter.
- (e) Describe the Momentum Equation. State the practical application of the momentum equation.
- (f) Define the terms C_d , C_c , C_v and derive the expression $C_d = C_c \times C_v$

Where C_d = Coefficient of discharge

C_c = Coefficient of contraction

C_v = Coefficient of velocity

3. Answer any TWO of the following :— (10×2=20)

- (a) Derive an expression for the loss of head due to friction in pipes.
- (b) Prove that for viscous flow through a circular pipe, the Kinetic energy correction factor is equal to 2.
- (c) What do you mean by dimensionless numbers ? Derive expression for any two-dimensionless numbers.

4. Answer any TWO of the following :— (10×2=20)

- (a) Define displacement thickness. Derive an expression for momentum thickness for boundary layer flow.
- (b) What do you mean by Separation of boundary layer ? What is the effect of pressure gradient on boundary layer thickness ?
- (c) What is meant by water hammer ? What allowance is usually made for this in penstock design.

5. Answer any TWO of the following :—

- (a) What is a Syphon ? Where is it used ? Explain its action. Derive an expression for the length of its inlet leg. (2+2+2+4=10)
- (b) (i) Derive an expression for the loss of head due to Sudden enlargement. (7)
(ii) What is equivalent pipe ? (3)
- (c) Differentiate between : (10)
 - (i) Stream lines body and Bluff body.
 - (ii) Friction drag and Pressure drag.