Roll No. | | | | | | | | | | |

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 $\Psi = A\left(x^2 - y^2\right)$ 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 2 m 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.

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