D17002032

Registration No: | | | | | | | | | | |

Total Number of Pages : 02 **M.TECH**

M.TECH 1ST SEMESTER REGULAR EXAMINATIONS, DECEMBER 2017
ADVANCED FLUID MECHANICS
Branch: TE, Subject Code:MTEPC1010
Time: 3 Hours
Max Marks : 70
The figures in the right hand margin indicate marks.

PART-A (10 X 2=20 MARKS)

1. Answer the following questions.

a) Define concept of continuum.
b) State Newtons law of viscosity.
c) What is body force and surface force?
d) Differentiate between free vortex and forced vortex motion of fluid.
e) Define momentum thickness.
f) Write prandtl mixing length hypothesis.
g) What is vorticity of flow.
h) What is coefficient of drag.
i) What are the different forms of energy in a flowing fluid?
j) Differentiate between Poiseuille flow and couetee flow.

PART-B (5 X 10=50 MARKS)

Answer any five questions from the following.

1. a) Given velocity of flow is $V = x^3yi + y^2zj - (3x^2yz+yz^2)k$. Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity and acceleration at a point of (2.-1, 1). [5]
   b) The stream function for two dimensional flow is given by $\psi = 2xy$. Calculate the velocity at P (2,3) . Find the velocity potential function. [5]
2. a) Derive the expression of Navier-Stokes equation in a Cartesian coordinate system.
   b) Write the limitation of Navier-Strokes equation. [8+2]
3. a) Derive the expression for fully developed laminar flow between two infinite parallel plates.
   b) Define pressure drag or form drag. [8+2]
4. a) Water at 80^0C flow between two large flat plates. The lower plate moves at a speed of 0.9 m/s. The plate spacing is 7 mm and flow is laminar. Determine the pressure gradient required to produce zero net flow at the cross- section. $(\mu)_{wat} = 4.9 \text{ X } 10^{-4}$ Ns/m^2
   b) Define intensity of turbulence and write its mathematical expression. [7+3]
5. a) Find the approximate expression for mixing length distribution in turbulent flow in pipe from prandtl one seventh power law.
   b) What is Reynolds transportation theorem? [7+3]
6. a) Air moves over a flat plate with a uniform free stream velocity 10 m/s. At position 15 cm front edge of the plate calculate the boundary layer thickness. Use a parabolic profile $\frac{u}{U\infty} = a+by+cy^2$
   Having boundary condition y = 0 u =0
   $Y = \delta \quad u = U\infty$
   $Y = \delta \quad \frac{\partial u}{\partial y} = 0$
   For air $\nu = 1.5 \text{ X} 10^{-5}$ m^2/s and $\rho = 1.23$ kg/m^3

b) Write the expression for Blasius equation with nomenclature. [8+2]

7. a) What do you meant by Shear strain rate [5+5]
   b) Describe Forced vortex flow

8. Write short notes of any two of the following [5+5]

   a) Stationary turbulence

   b) Differentiate between vectors and tensors

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