GIET MAIN CAMPUS AUTONOMOUS,
GUNUPUR - 765022

Registration No: | | | | | | | | | | | **M.TECH**

Total Number of Pages : 2

M.TECH 1ST SEMESTER REGULAR EXAMINATIONS, DECEMBER 2018

ADVANCED FLUID MECHANICS

Branch: TE, Subject Code:MTEPC1010

(Regulations 2018)

Time: 3 Hours **Max Marks : 70** **Question Code: RD18002010**

PART-A (10 X 2=20 Marks)

1. Answer the following questions.

a. What is uniform flow?
b. Define vorticity and circulation.
c. Write the equation of continuity for incompressible flow in two dimension.
d. Differentiate between free vortex and forced vortex motion of fluid.
e. Define momentum thickness.
f. What is skin friction coefficient?
g. Differentiate between wall turbulence and free turbulence.
h. What is friction factor in a laminar flow.
i. What do you mean by Heimenz flow.
j. Write down the velocity distribution equation of a fully developed flow in a circular

PART-B (5 X 10=50 Marks)

Answer any five questions from the following.

2 a) Given velocity of flow is V = (x^3y) i + (y^2z) j – $(3x^2yz+yz^2)$ 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 ψ =2xy. Calculate the velocity at P(2,3) . Find the velocity potential function . [5]

3. a) For two dimensional flow $\phi = 3xy\ and\ \psi = (3/2)(y^2-x^2)$. Determine the velocity component at the points (1,3) and (3.3) . Also find the discharge passing between the streamlines passing through the points given above. [5]

b) Derive pressure difference between two points in an in viscid flow field in a steady flow is (dp/ ρ) + (gdz) +(Vdv)= 0 [5]

4 a) Consider a flow field defined by, and $u\ \ x(1t), v1$ and w=0. Find the equation for streamline passing through the point (1, 1) and t=0. [5]

b) Derive the expression for fully developed laminar flow between two infinite parallel plate. [5]

5 a). Explain the following with neat sketch. (i) homogeneous turbulence,(ii) isotropic turbulence, (iii) intensity of turbulence. [5]

b) Express Reynolds stress matrix for turbulent flow and Compare the individual components in a three dimensional flow field. [5]

6 a) Derive prandtl boundary layer equation for steady two dimensional incompressible flow. Explain the significance of prandtl boundary layer equation in comparison with Navier-Stokes equation. [5]

b) Water at 60^0C flow between two large flat plates. The lower plate moves at a speed of 0.3 m/s. The plate spacing is 3 mm and flow is laminar. Determine the pressure gradient required to produce zero net flow at the cross- section. $(\mu)_{wat} = 4.7 \times 10^{-4}$ Ns/m^2 . [5]

7. 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 [5]

$\frac{u}{U_{\infty}}$ = a+by+cy^2

Having boundary condition y = 0 u =0

Y= δ u = U_{∞}

Y= δ $\frac{\partial u}{\partial y} = 0$

For air ν =1.5 X10^{-5} m^2/s and ρ =1.23 kg/m^3

b) Derive a relation for universal velocity distribution law and friction factor in ducts flow for very large Reynolds number. [5]

8. Write short notes on

a) stationary turbulence [5]

b) Von-Karman Velocity Defect Law [5]

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