M.Sc. - II (Mathematics) (New CBCS Pattern) Semester-IV

PSCMTH19A - (Core) : Fluid Dynamics - II

P. Pages : 2 **GUG/S/25/13770**

Time : Three Hours * 2 2 4 5 * Max. Marks : 100

Notes : 1. Solve all the **five** questions.
2. Each question carries equal marks.

UNIT - I

1. a) Derive the Navier-Stokes equation of motion of a viscous fluid. **10**

b) Obtain the relations between the stress and rate of strain. **10**

OR

c) Discuss the coefficient of viscosity and Laminar flow. **10**

d) Explain the energy Dissipation due to viscosity. **10**

UNIT - II

2. a) Explain the rate of flow of charge by considering the two cases fluid at rest and fluid in motion. **10**

b) State and prove the Alfven's theorem. **10**

OR

c) Explain the Magnetic Reynolds Number. **10**

d) Discuss the Maxwell's electromagnetic field equation when the medium at rest. **10**

UNIT - III

3. a) State and prove the Buckingham theorem. **10**

b) Derive the equation $\frac{\partial \bar{u}}{\partial \bar{x}} + \frac{\partial \bar{y}}{\partial \bar{y}} = 0$ for the laminar flow of a fluid at high Raynolds number over a smooth solid boundary. **10**

OR

c) Explain the Prandtl's boundary layer equation. **10**

d) Discuss Blasius solution. **10**

UNIT - IV

4. a) Discuss double correlation between turbulence velocity components. **10**

b) Explain the macro scale turbulence and obtain $\int_{-b}^{b} dx_2\left(\mu\left(x_2\right)\right)=0$ and **10**

$\int_{0}^{0/2} dr\, ru'(r)g(r)=0$.

OR

c) Discuss on integral scale of turbulence. **10**

d) Derive the equation for the conservation of a transferable scalar quantity in a turbulent flow. **10**

UNIT - V

5. a) Write a short notes on diffusion of vorticity. **5**

b) Show that the magnetic Reynolds number is given by $Rm = 4z\mu 6vL$. **5**

c) Write a short note on equation of motion of a conducting fluid. **5**

d) Define- **5**

i) Turbulence Intensity.

ii) Relative Intensity.

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