

# M.Sc. (P) Mathematics Paper-II, set B Viscous Fluid Dynamics

Time: 2:30 Maximum Marks: 100

## Unit I

- 1. (a) Show that the most general motion of a fluid element consists of a translation , a rotation and a deformation.
  - (b) define fourier's law of heat conduction and derive equation of energy.
- 2. (a)State and prove Buckingham  $\pi$  theorem in dimensional analysis.
  - (b) Write short notes on
  - (i) Reynolds number
- (ii) Prandtl number

### Unit II

- 3. (a) Derive and discuss velocity distribution in
  - (i) Plane coquette flow
- (ii) Plane Poiseuille flow

- (b) derive.
- 4. (a) Discuss about the steady flow of a viscous incompressible fluid through a tube of arbitrary but uniform, cross-section.
  - (b) Derive the velocity distribution and volume rat flow in a tube of rectangular cross- section.

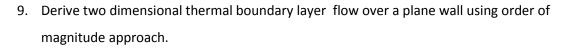
## **Unit-III**

- 5..(a) obtain an expression in the form  $\emptyset''' + 2\emptyset\emptyset'' \emptyset'^2 + 1 = 0$  which leads to the Solution for the velocity components for the flow near a stagnation in an axially symmetrical case.
  - (b) Discuss flow due to a plane wall suddenly set in motion.
- 6. Derive and discuss velocity distribution near a rotating disc in a fluid otherwise at rest. Also derive moment coefficient on wall.

#### Unit-IV

- 7. derive temperature distribution and Nusselt number in Hagen poiseuilli flow when wall of the pipe is kept at a constant temperature..
- 8. Derive velocity and temperature distribution in plane coquette flow with transpiration cooling.

#### Unit -V



10 Derive velocity components and drag coefficient in Stock's flow past a sphere.