S Y N O P S I S

The thesis comprising of six chapters is devoted to the study of some problems in rotating fluids. Chapter one gives a brief account of the previous work directly related to the present work.

Chapter two is devoted to a study of magnetohydrodynamic flow in a rotating pipe. The general problem of steady flow through ducts of arbitarary cross-section rotating with an angular velocity Ω about an axis perpendicular to the axis of the duct and subjected to the action of a uniform magnetic field, parallel to the axis of rotation is formulated as a boundary value problem. The problem in the non-dimensional form involves four parameters viz. the Taylor number, the Hartmann number, the Reynolds number and the magnetic Reynolds number. The solution is obtained by using a regular perturbation technique in terms of the parameter T. The detailed analysis of the problem of a circular pipe is given. The velocity and magnetic fields are calculated upto the second order terms.

Chapter three is devoted to the unsteady flow of a viscous, electrically conducting fluid, in a parallel plate channel rotating with an angular velocity Ω and subjected to a suddenly applied magnetic field. The exact solutions for the

velocity and the induced magnetic fields are obtained by using the Laplace and the finite Fourier transforms. The channel walls are assumed to be ideally conducting. It is found that unlike the non-rotating case, the velocity and the magnetic fields exhibit oscillatory characteristics for all values of the magnetic Prandtl number and the Hartmann number.

In chapter four is considered the flow due to an infinite mass of fluid bounded on one side by a disc and extending to infinity on the other. The fluid and the plate are rotating with a uniform angular velocity. A transverse magnetic field oscillating about a non-zero mean is applied at the disc which disturbs the rigid body rotation of the fluid. A Karman type similarity solution for the velocity and magnetic fields is obtained.

Chapter five is devoted to a study of combined forced and free convection heat transfer in a horizontal circular pipe rotating with a uniform angular velocity about a vertical axis. The secondary flow induced by rotation and the buoyancy force is studied. It is found that the effect of the rotation parameter T_h on the Nusselt number is of order T_h^2.

In the last chapter is discussed the problem of flow in a rotating wavy channel. The walls of the channel are located at $y = \pm x \pm \epsilon \cos x$, where x denotes the longitudinal axis and y the transverse coordinate. The problem in the

non-dimensional form involves two parameters the Reynolds number R and the Taylor number T besides the amplitude of the wall perturbation ϵ . A perturbation solution assuming ϵ to be small is obtained. The effect of rotation on the flow characteristics is obtained.
