The study of the dynamics of fluids in rotating systems has developed rapidly in recent years and has been a popular area of research owing to its importance in a wide variety of problems encountered in oceanography, geophysics, meteorology and atmospheric sciences. Rotating flow theory is utilized in determining the viscosity of fluids, in construction of turbines, swirl atomizers, vortex chambers and other centrifugal machines. Many aspects of the motion of terresterial and planetary atmospheres are induced by the effects of rotation. The analysis of such flows is interesting not only from the theoretical view point but also from the mathematical modelling. An excellent review on the theory of rotating fluids can be found in the monograph by Greenspan (1968).

Rotation in a fluid system manifests itself on the fluid particles through the Coriolis and the centrifugal forces. The balance between these forces and the pressure gradient, with correction for the viscous action at the boundaries, emerges as the back bone of the entire theory of rotating flows. In considering flows in rotating environments, we come across situations where the entire fluid is in a solid body rotation with the container boundaries. The state of rigid body rotation is the equilibrium configuration in which the angular momentum due to rotation provides stability to the flow. When a fluid element is displaced from its equilibrium position, the Coriolis force tends to restore it to its equilibrium position. In a steadily rotating system, a balance is struck between the Coriolis and the frictional forces in a thin layer over the boundaries. This layer, called the Ekman layer, plays a very fundamental role in rotating fluids. The physical phenomena in bounded and unbounded fluids differ in certain respects. The vorticity created at the boundary diffuses outward from the surface and in the presence of another boundary, the vorticity is confined within the boundaries all the time.

In engineering practice, the fluid flow associated with the rotating bodies are of much importance to the efficient operation of many devices of rotating machines. Many configurations of such devices can be idealised by a system consisting of one or two disks. These models are being used for a long time to study the fundamental aspects of boundary layer and transport processes. In such cases inertial frame of reference is used to analyse the physical system. The present thesis is concerned with the study of the time-dependent fluid flows about a disk rotating in contact with an incompressible viscous fluid.

Problems concerning the flow around rotating axially symmetric bodies arise in connection with turbine construction. Since the rotors of various turbines contain plane surfaces perpendicular to the axis of rotation as necessary