Abstract

The main aim of this thesis is to present some new and recent results from the theory of non-Newtonian fluids. Such results refer to different motions of generalized second grade and Oldroyd-B fluids and ordinary Maxwell fluids. Generally, the constitutive equations for generalized non-Newtonian fluids are obtained from those for non-Newtonian fluids by replacing the time derivatives of an integer order by the so called Rieman-Liouville fractional operators.

In chapter 2, it is studied the rotational flow of a generalized second grade fluid between two infinite coaxial cylinders. The velocity field $\omega(r,t)$ and the shear stress $\tau(r,t)$, obtained by means of Laplace and Hankel transforms, are presented under series form in terms of generalized G functions. The obtained solutions can be specialized to give the similar solutions for ordinary second grade and Newtonian fluids performing the same motion. Chapter 3 deals with the study of helical flow of generalized Oldroyd-B fluids in a single circular cylinder. The components of velocity field and their associated shear stresses have been found in terms of generalized G and R functions and are presented as sum of two terms, one of them is the similar solution for the Newtonian fluid. Chapter 4 contains some remarkable results regarding the energetic balance for the flow of Maxwell fluid due to a constantly accelerating plate. We have determined the dissipation, the power due to the shear stress at the wall and boundary layer thickness for this motion. The corresponding results for the similar flow of a Newtonian fluid are also recovered as special case. The specific features of both fluids are compared and discussed.