Abstract

In this thesis, transient flow of Jeffrey fluids above a permeable wall have been investigated. We use classical computational techniques capable of perfectly operating in order to attain exact analytical solutions. Several basic definitions and concepts about fluid motion and methods to solve the flow problems have been discussed.

Our aim is to find out some results regarding transient flow of incompressible Jeffrey fluid over a permeable, flat, infinite plate. The plate motion is an oscillatory translation along the x-axis. Using the Laplace transform and perturbation method, the analytical solution for the velocity field in the transformed domain has been obtained. The velocity field in the real domain has been determined by using the numerical Stehfest's algorithm for the inverse Laplace transform. To validate the obtained solution, we have determined the analytical solution for the flow without transpiration. It is found that when the transpiration parameter approaches zero, the solution for the flow with transpiration tends to the solution corresponding to the case without transpiration.

Moreover, this dissertation also contains the investigation of velocity of transient flow of Jeffrey fluid over an infinite horizontal porous plate under the influence of MHD and porosity. The major objective is to achieve the analytical solution for velocity above an accelerating porous plate. At the end, influence of the system parameters on fluid motion has been investigated by numerical simulations and graphical illustrations prepared with the software Mathcad package.