

SUMMARY

The aim of this thesis is to investigate three problems concerning the effect of external magnetic field and the non-Newtonian property on the flow of electrically conducting fluids near semi-infinite plates or wedges.

This thesis contains four chapters, the first chapter is a general introduction to the problems studied and the necessary background for mechanics of non-Newtonian fluids. Also it contains discussions of some previous works which are relevant to the problems studied in this thesis.

In the second chapter, we have considered the magnetohydrodynamic boundary layer flow of a non-Newtonian fluid past a wedge. In this problem, we used the method of successive approximation to solve the non-linear differential equation describing the system. The numerical investigation we have carried out are displayed in tables and figures which show that:

- (1) For constant Magnetic field M : the velocity field increases with increasing power n .

- (2) For constant power n ; the velocity field decreases as Magnetic field M increases.
- (3) For constant M ; both displacement and momentum thicknesses δ_1 , δ_2 respectively increase as n increases.
- (4) For constant n ; the displacement thickness δ_1 and momentum thickness δ_2 decreases as M increases.

Also, the skin-friction decreases as n increases for constant M and the skin-friction increases with M for constant n .

In the third chapter, the problem on magnetohydrodynamic unsteady flow of viscoelastic free convection fluid past an infinite plate with constant suction, was investigated. In this problem we have obtained an analytical expression for the velocity field. From the numerical results which we display in tables and figures, one can see that:

- (1) The velocity field increases as the elastic constant k increases for constant Magnetic field M .
- (2) The velocity field decreases as the Magnetic field M increases for constant elastic constant k .

Also, the skin-friction increases for constant M with increasing k and the skin-friction decreases for constant k with increasing M .

In the last chapter, we have studied the problem of boundary layer of non-Newtonian electrically conducting fluid over a semi-infinite flat plate under magnetic field. The velocity field was derived analytically using the power series method as a result of the simplification introduced to linearize the basic equation for the system. The numerical treatment to the analytical results leads to:

- (1) The velocity field increases as the non-Newtonian parameter N increases for constant Magnetic field M .
- (2) The velocity field decreases as Magnetic field M increases when the parameter N is constant.

Also, the skin-friction increases for constant M with increasing N and the skin-friction increases for constant N with increasing M .