

## Flow and heat transfer in three dimensional MHD Visco-elastic flow past a porous plate

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### Abstract

An analysis of the free convection visco-elastic flow and heat transfer along an infinite porous vertical plate with sinusoidal suction at the wall and uniform magnetic field applied parallel to the plate has been studied. The flow becomes three dimensional due to this type of suction velocity. The mathematical analysis is presented for the hydrodynamic boundary layer flow without taking into account the induced magnetic field. For the asymptotic flow condition the component of the plate skin friction along the main flow direction and the rate of heat transfer are obtained to observe the visco-elastic effects. The shear stress along the flow direction has been presented graphically for various values of visco-elastic parameter with the combination of other flow parameters.

*Key words:* Visco-elastic, free convection, MHD, three dimensional flow.

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### 1. Introduction

The study of convection has received much attention due to its numerous applications in energy related engineering problems. The process of free convection has its applications in cooling of nuclear reactors or in the study of the structures of stars and planets. The effects of magnetic field on the flow of an electrically conducting viscous fluid have been discussed widely because of its astrophysical,

geophysical and engineering applications. The flow through porous medium is quite prevalent in nature and therefore, the study of interaction of the geomagnetic field with the fluid flow in the geothermal region is of great interest to the geophysicists.

In view of the importance of the suction velocity the effects of different arrangements and configuration of the suction holes and slits have been studied extensively, both theoretical