A mathematical study of a MHD asymmetric flow between two parallel porous disks using Homotopy analysis method

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Abstract

The non-linear differential equations governing the MHD asymmetric flow of a conducting fluid between two porous disk has been solved using Homotopy analysis method. Semi-Analytical expression for velocity profile are obtained. The result are discussed graphically for varying the governing parameters.

Keywords:
MHD channel flow, porous disk, asymmetric flow, dimensionless velocity profile, Homotopy analysis method.

1. Introduction

In the recent days, the study of the (Magnetohydrodynamic) MHD flow of a conducting fluid between two porous disks grasped the attention of scientists and engineers for its vital role in the applications in various branches of industries and engineering such as MHD generators, MHD pumps, accelerators, electrostatic precipitation, polymer technology, Petroleum industries, purification of crude oil, plasma studies, nuclear reactors, geothermal energy extraction, the boundary control in the field of aerodynamics and blood flow problems. Based on the applications, a variety of mathematical models have been formulated to study the behaviour of the flow. The MHD flow of a second grade fluid through a porous medium was studied by [2] and [3]. The radiation effects of Maxwell fluid in a channel with porous medium was later discussed by [4]. Heat transfer effect of a laminar flow through parallel porous disk was examined by [5]. Heat generation / absorption on hydromagnetic flow with heat and mass transfer over a flat surface was investigated by [6]. Many studies on the hydromagnetic flow of a conducting fluid in the presence of magnetic field through the porous medium was made successfully by [7]-[14]. A fourth-grade fluid flow was illustrated by [15].

Considering various aspects of the problem, [1] deals with the study of the (Magnetohydrodynamic) MHD flow of a conducting fluid between two porous disks . [1] performed the illustration and obtained governing differential equation for velocity in dimensionless form. In this paper the non-linear differential equations obtained by [1] are solved analytically using HAM and the solutions are graphically compared with the numerical solution.