

On Non-Linear Magnetohydrodynamic Flow due to Peristaltic Transport of an Oldroyd 3-Constant Fluid

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In this work a theoretical analysis is presented for the problem of peristaltic transport of an incompressible Oldroyd 3-constant fluid in an infinite channel with flexible walls. The flow is induced by an infinite sinusoidal wave train moving along the walls of the channel. The fluid is electrically conducting and a magnetic field has been applied transversely to the flow. This problem has numerous applications in various branches of science. A perturbation solution of the stream function for zeroth-, first- and second-order in a small amplitude ratio is obtained. The obtained results are illustrated graphically to show salient features of the solutions. The effect of the magnetic parameter, the relaxation time and the retardation time on the mean axial velocity and the reversal flow is investigated. It is found that the possibility of flow reversal increases by increasing the magnetic parameter and viscoelastic parameters. The results show that the values of the mean axial velocity of an Oldroyd 3-constant fluid are less than these for a Newtonian fluid. Numerical results are reported for various values of the physical parameters of interest. – Mathematics Subject Classification: 76Z05.

Key words: Peristaltic Transport; Magnetohydrodynamic; Oldroyd 3-Constant Fluid; Non-Newtonian Fluid.