

Ariel, P. D.

Hiemenz flow in hydromagnetics. (English) Zbl 0815.76092
Acta Mech. 103, No. 1-4, 31-43 (1994).

The laminar flow of an incompressible, viscous, electrically conducting fluid impinging normal to a plane in the presence of a transverse magnetic field is investigated. Using finite differences and quasilinearizations, an exact numerical solution is presented which takes into account the asymptotic boundary condition.

MSC:

76W05 Magnetohydrodynamics and electrohydrodynamics

76M20 Finite difference methods applied to problems in fluid mechanics

Cited in **26** Documents

Keywords:

[perturbation solution](#); [approximate solution](#); [transverse magnetic field](#); [quasilinearizations](#); [asymptotic boundary condition](#)

Full Text: [DOI](#)

References:

- [1] Hiemenz, K.: Die Grenzschicht an einem in den gleichförmigen Flüssigkeitsstrom eingetauchten geraden Kreiszyylinder. *Dingl. Polytech. J*326, 321-410 (1911).
- [2] Nachtsheim, P. R., Swigert, P.: Satisfaction of asymptotic boundary conditions in numerical solution of systems of non-linear equations of the boundary layer type. NASA TN D 3004, October 1965.
- [3] Beard, D. W., Walters, K.: Elastico-viscous boundary layer flows. I. Two dimensional flow near a stagnation point. *Proc. Camb. Phil. Soc.*60, 667-674 (1964). · [Zbl 0123.41601](#) · [doi:10.1017/S0305004100038147](#)
- [4] Kummerer, H.: Some comments on the papers "Similar solutions for the incompressible laminar boundary layer with pressure gradient in micropolar fluids" and "Nonsimilar incompressible laminar boundary-layer flows in micropolar fluids" by G. Nath. *Rheol. Acta*15, 584 (1976). · [doi:10.1007/BF01515883](#)
- [5] Ariel, P. D.: A hybrid method for computing the flow of visco-elastic fluids. *Int. J. Num. Meth. Fluids*14, 757-774 (1992). · [Zbl 0753.76111](#) · [doi:10.1002/fld.1650140702](#)
- [6] Ariel, P. D.: Computation of flow of viscoelastic fluids by parameter differentiation. *Int. J. Num. Meth. Fluids*15, 1295-1312 (1992). · [Zbl 0825.76541](#) · [doi:10.1002/fld.1650151105](#)
- [7] Djukic, D. S.: Hiemenz magnetic flow of power-law fluids. *Trans. ASME, J. Appl. Mech.*40, 822-823 (1974). · [doi:10.1115/1.3423405](#)
- [8] Nath, G.: Similar solutions for the incompressible laminar boundary layer with pressure gradient in micropolar fluids. *Rheol. Acta*14, 850-857 (1975). · [Zbl 0312.76001](#) · [doi:10.1007/BF01521414](#)
- [9] Na, T. Y.: *Computational methods in engineering boundary value problems*. New York: Academic Press 1979. · [Zbl 0456.76002](#)
- [10] Hartmann, J.: Theory of the laminar flow of an electrically conducting liquid in a homogeneous magnetic field. *Math-Fys. Medd.* 5, No. 6 (1937).
- [11] Stoer, J., Bulirsch, R.: *Introduction to numerical analysis*. Berlin, Heidelberg, New York: Springer 1980. · [Zbl 0423.65002](#)
- [12] Falkner, V. M., Skan, S. W.: Some approximate solutions of the boundary layer equations. *Phil. Mag.*12, 865-896 (1931). · [Zbl 0003.17401](#)
- [13] Fletcher, C. A. J.: *Computational techniques for fluid dynamics, Vol. 1*. Berlin, Heidelberg, New York, Tokyo: Springer 1988. · [Zbl 0706.76001](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.