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A new finite difference algorithm for computing the boundary layer flow of viscoelastic fluids in hydromagnetics. (English) ☐ Zbl 1067.76584

Summary: A new algorithm combining the features of finite differences and quasilinearization is presented to compute the boundary layer flow of viscoelastic fluids in the presence of a magnetic field. Two problems are considered: (i) two-dimensional stagnation point flow, and (ii) flow over a stretching sheet. For these flows the problem reduces to the solution of a boundary value problem in which the order of the differential equation exceeds the number of boundary conditions. The exact numerical solutions are obtained using the present algorithm. Also, the first-order perturbation solutions (in terms of the viscoelastic fluid parameter) are derived. A comparison of the results shows that the perturbation method is inadequate in predicting some of the vital characteristic features of the flows, which can possibly be revealed only by the exact numerical solution.

MSC:

76M20	Finite difference methods applied to problems in fluid mechanics
76A10	Viscoelastic fluids
76W05	Magnetohydrodynamics and electrohydrodynamics

Cited in **4** Documents

Software:

YSMP

Full Text: DOI

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