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MHD Stagnation Point Flow towards a Shrinking Sheet with Suction in an Upper-Convected Maxwell (UCM) Fluid

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Abstract : The present analysis considers the steady stagnation point flow and heat transfer towards a permeable sheet in an upper-convected Maxwell (UCM) electrically conducting fluid, with a constant magnetic field applied in the transverse direction to flow, and a local heat generation within the boundary layer with a heat generation rate proportional to (T-T_inf)^p. Using a similarity transformation, the governing system of partial differential equations is first transformed into a system of ordinary differential equations, which is then solved numerically using a finite-difference scheme known as the Keller-box method. Numerical results are obtained for the flow and thermal fields for various values of the shrinking/stretching parameter lambda, the magnetic parameter M, the elastic parameter K, the Prandtl number Pr, the suction parameter s, the heat generation parameter Q, and the exponent p. The results indicate the existence of dual solutions for the shrinking sheet up to a critical value lambda_c whose value depends on the value of M, K, and s. In the presence of internal heat absorbtion (Q<0), the surface heat transfer rate decreases with increasing p but increases with parameter Q and s, when the sheet is either stretched or shrunk.

Keywords : magnetohydrodynamic (MHD), boundary layer flow, UCM fluid, stagnation point, shrinking sheet
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