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Non-Newtonian mixed convection flowon a vertical surface in the presence of a magnetic field

The combined forced and free convection flow (mixed convection flow) is encountered in many technological and industrial applications which include solar central receivers exposed to wind currents, electronic devices cooled by fans, nuclear reactors cooled during emergency shutdown, heat exchangers placed in a low-velocity-environment, etc. The two-dimensional stagnation-point flow in a forced convection refers to the flow in the vicinity of a stagnation line that result from a two-dimensional flow impinging on a surface at right angles and flowing there after symmetrically about the stagnation line. The mixed convection in stagnation flow is important when the buoyancy forces due to the temperature difference between the surface and the free stream become large. Consequently, both the flow and thermal fields are significantly affected by the buoyancy forces. An analysis of the steady magnetohydrodynamics (MHD) mixed convection flow of a viscoelastic fluid stagnating orthogonally on a heated or cooled vertical flat plate has been studied. Using similarity variables, the governing equations are transformed into a system of two coupled non-linear ordinary differential equations. The resulting equations are then solved numerically using the spectral method.