Stability analysis of MHD carreau fluid flow over a permeable shrinking sheet with thermal radiation

ABSTRACT

Dual solutions are discovered in the problem of magnetohydrodynamics (MHD) boundary layer flow of Carreau fluid over a permeable shrinking sheet with thermal radiation. Therefore, a stability analysis is carried out to identify the stable solution of this problem. For the stability analysis, the problem is considered to be unsteady with time derivative introduced into the governing equations. Next, time-dependent solutions are substituted into these equations to form linear eigenvalue equations. The smallest eigenvalue of these equations is then computed using the bvp4c solver in MATLAB. The results showed that the first solution is stable, while the second solution is unstable. The first solution is physically meaningful and realizable in practice, and thus significant to the problem.

Keyword : Carreau fluid; MHD; Shrinking sheet; Stability analysis