

Contents

Abstract–Analysis of heat transfer in boundary layer stagnation-point flow over a non-isothermal shrinking sheet is carried out. The governing continuity, momentum, and energy equations together with the boundary conditions are reduced to a set of self-similar nonlinear ordinary differential equations using similarity transformation and are then solved numerically by shooting method. The variations in dual temperature profiles are obtained for the variation of surface temperature. The effects of various parameters, viz., power-law exponent, velocity ratio parameter and Prandtl number involved in the equations, on the heat transfer in presence of variable wall temperature are presented in some figures and discussed rigorously.

Abstract–The unsteady MHD heat and mass transfer flow past a moving semi-infinite vertical porous plate with thermal diffusion is investigated numerically taking into account the induced magnetic field. The steady-state numerical solutions for the velocity field, induced magnetic field, temperature distribution and concentration distribution are obtained by the explicit finite difference method. The local and average shear stress, current density, Nusselt number as well as Sherwood number are also calculated. The stability and convergence of the present scheme are established. Comparisons with existing analytical and numerical results verify the accuracy of the present results.

Abstract–An analysis is presented to investigate the effects of thermal radiation on MHD convective heat and mass transfer in a nanofluid flow over a stretching surface in presence of viscous dissipation, Joule heating and chemical reaction. In particular, we focus on Cu-water and Ag-water nanofluids. The governing boundary layer equations are written into a dimensionless form obtained by similarity transformations, which are solved numerically by means of the efficient numerical shooting technique with fourth-order Runge–Kutta scheme. Numerical results are obtained and presented through graphs and tables for various values of pertinent parameters. Comparisons with previously published works are performed, and excellent agreement between the results is obtained.

Abstract–The unsteady radiative nanofluid flow past a heated stretching permeable surface is investigated, in presence of magnetic field including the effects of Brownian motion and thermophoresis. The resulting partial differential equations take the form of ordinary differential equation by employing suitable transformation and then solved numerically. The effects of arising relevant parameters on the flow characteristics are presented through tables and graphs, and are discussed with physical implication. Our analysis revealed that the fluid temperature is higher in the presence of magnetic field. It is also observed that the wall stress decreases with increasing the strength of magnetic field.

Abstract–The thermal effect on vibrations of a symmetric non-homogeneous trapezoidal plate is studied, whose thickness varies bilinearly and density varies parabolically. On the basis of classical plate theory the governing differential equations is originated by Rayleigh–Ritz method. The two term deflection function is considered with C-S-C-S boundary condition. Natural frequencies for the first two modes of vibration are computed for different values of taper constants, thermal gradient, aspect ratio and non-homogeneity constant. The results are shown in tabular manner. Comparison is also presented.

Abstract–A semi-similar solution of an unsteady laminar axisymmetric highly accelerated boundary layer flow with massive blowing is obtained when the free stream velocity varies arbitrarily with time. The resulting partial differential equations governing the flow is solved numerically using an implicit finite difference scheme with the quasi-linearization technique. The effect of massive blowing and acceleration parameter on skin friction and heat transfer is observed. The results indicate that large injection rates move the viscous boundary layer away from the surface and the acceleration parameter reduces the thickness of momentum and thermal boundary layer. The variation of the density-viscosity product across the boundary layer is found to be negligible for large blowing rates. Further, the effects of dissipation parameter and wall enthalpy on skin friction and heat transfer are also discussed. The results are obtained for two particular unsteady free stream velocity distributions: (i) an accelerating stream and (ii) a decelerating stream.

Abstract–The changes in electrical parameters of the induction crucible furnace with a ferromagnetic lumpy charge are investigated. As the analytical description of the system furnace–lumpy charge ranging from the room temperature to Curie point is extremely difficult, the investigation is carried out by physical modeling. The results are discussed.

Abstract–Industrial inductive power transfer (IPT) systems have a wide variety in regard to the matching circuits, positioning and character of the load. Considering each of them separately impedes their study and comparative evaluation and does not allow an idea of parameters common to all IPT system that define the actual properties and characteristics. The disadvantage of individual examination is the fact that there are not clarified the requirements for synthesis of more complex matching circuits of the commonly used parallel and series connections. Along with the analytical ratios of harmonic analysis of HF energy sources and practical experience of their use it can be shown that there are common parameters characterizing their basic properties and principles of work. As such there may be mentioned the phase angle of the primary AC circuit of IPT - δ and the ratio value of the natural AC circuit frequency and the control frequency - $\omega_{\mathrm{NF}}/\omega$. Also, the quality factor Q of the equivalent AC circuit of the high frequency power supply can be added. The aim of this work is to prove that the phase angle in AC circuit δ and the ratio of the frequencies of AC circuit $\omega_{\mathrm{NF}}/\omega$ are essential and determining parameter of industrial inductive power transfer systems, regardless of scheme, mode of operation and character of the load. Another aim is to evaluate the most frequently used matching circuits.