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MHD Boundary Layer Flow of a Nanofluid Past a Wedge Shaped Wick in Heat Pipe

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Abstract : This paper deals with the theoretical and numerical investigation of magneto-hydrodynamic boundary layer flow of a nano fluid past a wedge shaped wick in heat pipe used for the cooling of electronic components and different type of machines. To incorporate the effect of nanoparticle diameter, concentration of nanoparticles in the pure fluid, nano thermal layer formed around the nanoparticle and Brownian motion of nano particles etc., appropriate models are used for the effective thermal and physical properties of nano fluids. To model the rotation of nano particles inside the base fluid, microfluidics theory is used. In this investigation ethylene glycol (EG) based nanofluids, are taken into account. The non-linear equations governing the flow and heat transfer are solved by using a very effective particle swarm optimization technique along with Runge-Kutta method. The values of heat transfer coefficient are found for different parameters involved in the formulation viz. nanoparticle concentration, nanoparticle size, magnetic field and wedge angle etc. It is found that the wedge angle, presence of magnetic field, nanoparticle size and nanoparticle concentration etc. have prominent effects on fluid flow and heat transfer characteristics for the considered configuration.

Keywords : nanofluids, wedge shaped wick, heat pipe, numerical modeling, particle swarm optimization, nanofluid applications, Heat transfer
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