ON THE NUMERICAL SOLUTION OF DUAL-PHASE-LAGGING EQUATION IN A MULTILAYERED NANOSCALE SOLID

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Abstract. In this article we consider the dual-phase-lagging heat conduction equation in a multi-layered nano-scale solid structure with a temperature-jump boundary condition and a new thermal lagging interfacial effect condition between layers. We construct a second-order accurate finite difference scheme for solving the heat conduction problem. To be more precise our numerical approximation is such that at all inner grid points has second-order temporal and spatial truncation errors, while at the boundary points and at inter-facial points has second-order temporal truncation error and first-order spatial truncation error, respectively. Then, we prove that the difference scheme introduced is unconditionally stable, convergent, and has rate of convergence two in space and time for the L_∞-norm. Moreover, we give two numerical examples to confirm our theoretical results and the application to the thermal analysis in the case of a three-layered problem.

Keywords: convergence; lagging equation; finite difference scheme; stability

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