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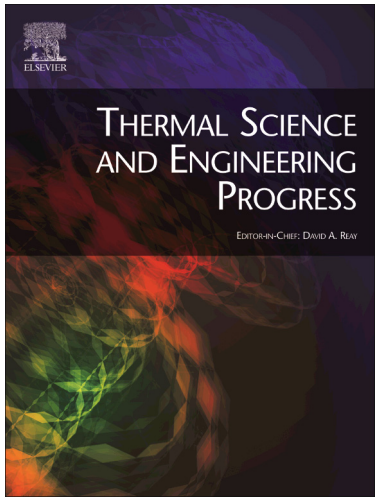

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S.S. Ghadikolaei, M. Yassari, H. Sadeghi, Kh. Hosseinzadeh, D.D. Ganji

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Analytical solution of viscoelastic non-Newtonian Second-grade fluid flow on a stretching sheet

S.S. Ghadikolaei[a], M.Yassari[a], H. Sadeghi[a], Kh. Hosseinzadeh[b*], D.D. Ganji[b]

[a]Mazandaran university science and Technology , Department of Mechanical Engineering, , Babol, Iran

[b]Department of Mechanical Engineering, Babol Noushirvani University of Technology, Babol, Iran

[*]Corresponding author, E-mail: khashayar_h68@yahoo.com

Abstract

This paper analyzes flow and heat transfer of an incompressible homogeneous second-grade fluid over a stretching sheet. Further, nonlinear differential equations solving this problem are presented which are solved by the hemotopy perturbation method (HPM) using MAPLE software. The main goal of this paper is to compare the results of solving the velocity and temperature equations in the presence of k changes through HPM and Nam for introducing HPM as a precise and appropriate method for solving nonlinear differential equations. In the following, the effects of changes in the viscoelastic parameter (k) values and Prandtl number (σ) on velocity and temperature profiles are studied. The most important results of these comparisons and studies are the high precision of the hemotopy perturbation method in solving nonlinear differential equations and also the dual behavior of k in velocity and temperature profiles, the direct relation of σ and with temperature distribution and its ineffectiveness on fluid velocity can also be mentioned.

Key words: second-grade fluid, stretching sheet, hemotopy perturbation method (HPM), viscoelastic parameter, Prandtl number.

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