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عنوان مقاله:

Sensitivity Analysis of Pulsatile Hydromagnetic Biofluid Flow and Heat Transfer with Non Linear Darcy-Forchheimer Drag

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خلاصه مقاله:

In the present paper we examine the pulsatile hydromagnetic flow and heat transfer of a non-Newtonian biofluid through a saturated non-Darcian porous medium channel. The upper plate of the channel is heated and the lower plate is cooled. The Nakamura-Sawada rheological model is employed which provides a higher yield stress than the Casson model. A Darcy-Forchheimer porous medium drag force model is incorporated to simulate blood vessel blockage with deposits in the cardiovascular system. Viscous heating is also included in the energy equation. The governing conservation equations for mass, momentum and energy equation are transformed into a system of nonlinear, coupled ordinary differential equations and these are solved numerically using finite element method. The effect of other important parameters such as magnetohydrodynamic parameter (Nm), Reynolds number (Re), Eckert number (Ec), Darcian parameter (), Forchheimer parameter (NF) and Prandtl number on velocity and temperature profiles are studied graphically. Spatial-temporal velocity and temperature profile visualizations are also presented. Numerical results shows that normalized fluid velocity (U) increases throughout the channel (-۱ < Y < ۱) with an increase in Reynolds number, Darcian parameter, steady pressure gradient parameter and rheological parameter; conversely velocity is decreased with the increase in magnetic parameter and Forchheimer quadratic drag parameter. Higher Eckert number (Ec = ۳) is also found to have a considerable effect on temperature ( ) profile. Finite difference numerical computations are also compared with the finite element solutions to verify efficiency and accuracy.

کلمات کلیدی:

Magneto, Pulsatile, Hydrodynamic, Heat transfer, Porous media, Rheology, Eckert number, Numerical

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