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ORIGINAL PAPER

Double Shehu Transform Reduced Differential Transform for Analyzing Electro-Osmotic MHD Flow Through a Curved Artery with Stenosis and Thrombosis

Ammar Al-Salih[1] · **Abdul-Sattar Jaber Al-Saif**[1]

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Abstract

This study presents an innovative approach for obtaining approximate analytical solutions that describe the behavior of electro-osmotic, magnetohydrodynamic nanofluid blood flow in a stenosed and curved artery influenced by thrombosis and catheterization. The proposed technique is based on the integration of the double Shehu transform and the reduced differential transform method (RDTM). This investigation also explores the effects of various physical parameters on the velocity and temperature of blood flow within the stenosed artery. The results indicate that increasing the magnetic field strength reduces both velocity and flow rate. Increasing the size of nanoparticles enhances the velocity, temperature, and flow rate. However, a higher nanoparticle shape factor leads to reductions in both velocity and temperature. Furthermore, an increase in the hematocrit parameter raises the concentration of red blood cells, which increases the fluid's viscosity, resulting in decreased velocity and reduced flow rate. Contour plots illustrate the variations in blood flow velocity under different magnetic field intensities and nanoparticle volume fractions. The results demonstrated that the proposed approach offers high accuracy and efficiency. In addition, the error table and convergence analysis demonstrate the new technique's efficiency and performance theoretically and computationally. This study contributes to a better understanding of how stenosis and thrombosis influence blood flow in arteries and offers helpful information regarding treatment planning and the development of more effective drug delivery strategies.

Keywords Double Shehu transform · Reduced differential transform · Stenosis artery · Blood flow · Convergence analysis

✉ Ammar Al-Salih
ammar.radhii@uobasrah.edu.iq

Abdul-Sattar Jaber Al-Saif
abdulsattar.ali@uobasrah.edu.iq

[1] Department of Mathematics, College of Education for Pure Science, Basrah University, Basrah, Iraq

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