عنوان مقاله:

An analytical solution of pulsatile micropolar flows in small tubes

محل انتشار:

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خلاصه مقاله:

Pulsatile fully-developed flows of micropolar fluids whose elements can undergo rotations as well as translations in a straight circular tube are addressed. The governing field of equation for such flows turns out to be linear coupled partial differential system. The equations are subjected to boundary conditions of velocity and microrotation which were suggested by Kirawan. Because there is no singularity point in the field of solution, standard perturbation method has been used successfully to approach the problem. To apply this perturbation method, a small parameter must exist in the system of equation. Therefore a dimension analysis has been preformed and it has been observed that if the radius of the tube is small, the production of Reynolds and Womersley numbers is too small in compassion of the other terms that exist in the equations. In the first step first-order approximations have been obtained and then their solutions have been replaced in equations to find second iteration. The higher order approximations in small tubes could be neglected. By making use of this method of solution, higher order approximation terms could be calculated to accomplish more reliable answer. These solutions have the promise of application to many practically important physical situations such as flows of polymeric fluids with deformable spring suspensions and flows of biological fluids including blood with deformable cells suspension in small arteries.

کلمات کلیدی:

Micropolar Fluid, non-Newtonian Fluid,Scale Analysis, Perturbation Method

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