UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

UNSTEADY MICROPOLAR FLUID OVER A PERMEABLE CURVE STRETCHING SHRINKING SURFACE BY USING BVP4C

(P37M22)

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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NOMENCLATURE

- v, u :Velocity component in the$x$- and y-direction, respectively.
- p : pressure
- ρ : the density
- ν : kinematic viscosity
- γ : spin gradient viscosity
- K : micropolar or material parameter.
- k : dimensionless curvature parameter
- j : Microinertia density
- a: Constant
- β: Unsteadiness parameter
- S: Constant mass flux
- λ: Velocity ratio parameter
- n: Ratio of the microrotation vector component and the fluid skin friction at the wall
- R: Radius/distance of the sheet from origin
- $R0$: Characteristic radius
- C_f: Skin friction
- C_m: Couple stress
- Rex: Local Reynolds number
- $f'(\eta)$: Velocity profile
- $g(\eta)$: Microrotation velocity profile

ABBREVIATION

- BVP4C: Boundary value problem for the fourth order method
- MATLAB: Matrix Laboratory
- MHD: Magnetohydrodynamic
- ADM: Adomian decomposition Method
- VIM: Variation Iteration Method
- ODE: Ordinary differential equation
- PDE: Partial differential equation

ABSTRACT

This research utilises BVP4C to deal with the unstable micropolar fluid over a permeable curve stretching and shrinking surface. The equation has first been changed from a partial differential equation into an ordinary differential equation by taking into account the similarity variable and the boundary condition. To solve the altered equations, a numerical method utilising MATLAB in conjunction with BVP4C is put into practise. In Microsoft Excel, the effects of the governing parameters on couple stress and skin friction are visually shown. The graphical results also show that there are two solutions for weak and strong concentration as well as for stretching and shrinking surfaces. A comparison of earlier findings has been made, and it has been demonstrated that there is no contradiction. . It has been observed that for curved sheets as opposed to flat sheets, the boundary layer thickness increases. For both strong concentration (n = 0) and weak concentration (n = 0.5), values of skin friction and couple stress coefficient falling as K increases for shrinking cases ($\lambda < 0$) and rising as K increases for stretching cases ($\lambda > 0$). e can also find the value against other parameters such as S and Beta as we only find the solution against η. After all, we can make a comparison of our results for the couple stress and skin friction with previous study. Thus, we can get the results that are more precise.