FREE CONVECTION BOUNDARY LAYER FLOW OF VISCOELASTIC MICROPOLAR FLUID PAST A HORIZONTAL CIRCULAR CYLINDER

LAILA AMERA AZIZa , ABDUL RAHMAN MOHD KASIMb , MOHD ZUKI SALLEHc & SHARIDAN SHAFIE

a,b,c Kumpulan Penyelidikan Sains Gunaan dan Industri, Fakulti Sains & Teknologi Industri, Universiti Malaysia Pahang, 26300 Kuantan, Pahang, Malaysia
laila@ump.edu.my , rahmanmohd@ump.edu.my , zuki@ump.edu.my

dJabatan Sains Matematik, Fakulti Sains,
Universiti Teknologi Mara, 81310 Johor, Malaysia
sharidan@utm.my

ABSTRACT

This study intends to observe the difference in behaviour of the flow of viscoelastic micropolar fluid at the boundary layer of a horizontal circular cylinder when different boundary conditions are imposed. The boundary conditions that are of interest are the constant surface temperature, constant surface heat flux, Newtonian heating and convective boundary conditions. First, a set of governing equations is formulated for each boundary condition before they are transformed into dimensionless form. Stream function is then applied to the obtained equations, producing sets of partial differential equations which are then solved numerically using a finite difference scheme, namely the Keller-box method. The behavioural pattern of the fluid flow on each boundary condition is observed based on how it influences the viscoelastic parameter, K, material parameter, K1, and the magnetic parameter, M for the velocity and temperature distributions.

Keywords: viscoelastic; micropolar; boundary conditions, horizontal circular cylinder, aligned MHD