Abstract No: 48 ***ICT, Mathematics and Statistics***

NON-LINEAR DISPERSION OF A CHEMICAL POLLUTANT INTO A RIVER WITH NON-LINEAR INITIAL FLOW

E.M.D.R.K. Ekanayaka* and M.T.M. Dewasurendra

Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka
**dineshruvan789@gmail.com*

The boundary value problem has developed into an important area of research of fluid dynamics. It is a system of ordinary or partial differential equations with the solution and derivative values specified at the boundaries. In this study, we generalized the boundary value problem derived by Van Gorder considering non-linear initial flow with an added chemical pollutant to ascertain the velocity profile's behaviour and the pollutant concentration. By introducing a new parameter *m*, we were able to present a general formula for the initial velocity when a particle is released into water. Here, we considered the system of partial differential equations using both concentration equation and Navier-Stokes equation, important for effectively predicting the outcome of river pollution. By introducing dimensionless parameters, the system has been converted into a dimensionless form. Then, we converted the governing system into systems of non-linear ordinary differential equations via similarity transformation and obtained solution curves numerically by the Runge-Kutta method. For a given set of parameters, numerical results were obtained using Maple software. These results differ from those in literature, as the non-linear variable initial flow has not been considered for this model. It could be analysed that the values of *m* did not affect the concentration function. But when *m* was increased, the graph of the velocity function decreased. The gradient of the curve supplies the velocity at each point of the motion. Physically, this model is applicable while spreading a chemical pollutant into a river when a spill is in progress. Further, present results form an inspiring study of a pollutant problem, and hence, results are relevant to those working in the field of environmental engineering.

Keywords: Analytical solutions, Nonlinear partial differential equations, Pollutant dispersion, Runge-Kutta Method