A numerical solution of the initial flow generated by combined (2-DoF) rectilinear and rotational cylinder oscillation

Q. M. Al-Mdallal
Department of Mathematical Sciences, United Arab Emirates University
P. O. Box 17551, UAE University, Al-Ain, United Arab Emirates
q.almdallal@uaeu.ac.ae

A numerical study is presented for the initial flow of two-dimensional viscous incompressible flow past a circular cylinder forced to oscillate in Two-Degree-of-Freedom (2-DoF) rectilinear and rotational cylinder oscillation. A perturbation theory is implemented to capture the development of the physical properties of the flow at early times. The results are conducted at different values of Reynolds number $R = 100 - \infty$; displacement amplitude-to-cylinder radius ratios of $A = 0.2 - 1.0$ and the forcing frequency values f are chosen from 0.05 to 0.4. Comparisons with existing results verify the accuracy of the present results.