

On the spinning motion of a disc under the influence a gyrostatic moment

Mohamed Mohamed, Tarek Amer

Abstract: This work discusses the movement of a disc around one of its settled point different from its centre of mass in the presence of a constant gyrostatic moment about the principal axes of inertia. The governing system of motion comprises of six nonlinear differential equations and their first integrals are lessened to another quasilinear independent one of 2DOF besides one first integral. At first, it is conjectured that the body is quickly spun around one of its principal axes. The technique of small parameter of Poincaré is utilized to accomplish the desired approximate arrangements of the conditions of movement. Euler's angles are utilized to translate the movement of the body at any flicker. The numerical arrangements of self-governing framework are explored utilizing the fourth order Runge-Kutta algorithms(RKA). The examination of both two solutions uncovers that the numerical solutions are in good agreement with the approximate ones and the deviation between them is very small. The significance of this work is centered around its extraordinary applications in numerous fields, for example, in designing, material science and modern applications for ships stabilizers, racing cars, pointing devices for computer, satellites and like.

¹⁾ Mohamed Mohamed, Associate Professor: Tanta university, ELbahr Street, Egypt (EG), m.ali@f-eng.tanta.edu.eg.

²⁾ Tarek Amer, Professor: Tanta university, Mathematics Department, Faculty of Science, Tanta University, Tanta 31527, Egypt, Egypt (EG), tarek,saleh@science.tanta.edu.eg.