



Existence and Stability of Equilibrium Points in the Problem of a Geo-Centric Satellite Including the Earth's Equatorial Ellipticity

Sushil Yadav¹, Vinay Kumar^{2*} and Rajiv Aggarwal³.

¹ *Maharaja Agrasen College, University of Delhi, Delhi, India*

² *Zakir Husain Delhi College, University of Delhi, Delhi, India*

³ *Sri Aurobindo College, University of Delhi, Delhi, India*

Received: November 12, 2017; Revised: September 26, 2019

Abstract: This paper deals with the existence and stability of the equilibrium points in the problem of a geo-centric satellite including the earth's equatorial ellipticity. We have determined the equations of motion of the geo-centric satellite which include the earth's equatorial ellipticity parameter Γ (the satellite's angular position relative to the minor axis of the earth's equatorial section) and then we have investigated the existence and stability of equilibrium points. It is observed that there exists an infinite number of equilibrium points which lie on a circle for different values of Γ . It is shown that the effect of the earth's equatorial ellipticity parameter Γ on the location of equilibrium points is very small (i.e., the coordinates of the equilibrium points are different after the fifth decimal places). Further, we have observed that the collinear points are unstable for different values of Γ . The non-collinear points lying on the y-axis are unstable for different values of Γ . We have also found that some of the non-collinear points lying on the circle are stable and others are unstable for different values of Γ .

Keywords: *geo-centric satellite; earth's equatorial ellipticity; equilibrium points and stability.*

Mathematics Subject Classification (2010): 70F07, 70F10, 70F15.

* Corresponding author: <mailto:vkumar@zh.du.ac.in>